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CHINA REPORT

SCIENCE AND TECHNOLOGY

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NATIONAL DEVELOPMENTS

CHINA'S TECHNOLOGY IMPORT POLICY UNCHANGED

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 1 Oct 85 p 2

[Article by Wang Xidong [3769 2569 2639] and Shi Chunzhi [2457 4783 1807]: "Our Country's Technology Import Policy Is Unchanged: Implementation of Contract Approval Procedures Will Expedite Development of Technology Import Work"]

[Text] Once approved by the State Council and issued by the Trade Ministry, the "Approval Procedures for Contracts Involving Technology Imports" will begin to take effect on 1 October. Just prior to that time, reporters visited with the vice director of the Technology Import/Export Economic Trade Bureau.

This official pointed out that the purpose of the "Procedures" is to strengthen technological cooperation between Chinese and foreign interests and to expedite the growth of foreign technological imports. He said that the "Procedures'" legal form is designed to dispel doubts foreign interests might have with regard to transferring technology to China; it safeguards and guarantees the legal rights and interests of Chinese and foreign enterprises.

The "Approval Procedures for Contracts Involving Technology Imports" stipulates that any sector signing a contract that involves the importation of technology must go through government approval procedures. The purpose of this is to catch any potential unreasonable conditions in such contracts in a final examination, thus protecting the enterprise interests. At the same time, this process will ensure that the contract has a definite legal status.

This official said that once a contract involving technology imports has secured government approval, the domestic and foreign enterprises signing the contract must proceed in all matters according to the law, and not unilaterally renege on any part of a government-approved contract. In this way, we will be able to increase the importance of such documents and ensure their legal protection as well, which is in the best interests of both sides.

He said that in order to increase the effectiveness of the work of approving such contracts, and in order to exercise the functions of local economic and trade departments, the country will not be concentrating approval authority centrally, but rather will distribute such authority in various degrees according to the level of administrative authority, granting approval authority to local areas and thereby encouraging their enthusiasm.

He pointed out that in the past there were a number of cases in which enterprises who were not aware had signed contracts not submitted to them for government approval and it was found later that these contracts in fact violated the law. There were also other places that had cases of an excessive number of imports or redundant items, thus resulting in a waste of our country's foreign currency reserves. Instituting government approval procedures will be a great help in strengthening the direction of and organizing our country's enterprises and will give full reign to technology importing, thus increasing cost effectiveness.

China currently has 400,000 enterprises that are in need of technological improvement, and the range of Sino-foreign technological cooperation is quite broad. From 1981 to the present, there have already been 1,300 plans involving technological imports with a volume of $4.6 billion that have been approved by the Ministry of Foreign Economic Relations and Trade alone, and of those 66 percent were contracts signed with Japan, the United States, and West Germany. The primary kind of technology involved mechanics, electronics, light textiles, construction, chemicals, etc.

This official stressed that importing advanced technology is a long-term policy in China and will not change. China not only abides by the relevant stipulations of the "Patent Laws," but at the same time recognizes the proprietary technological rights of enterprises and individuals.

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CSO: 4008/2009

OVERVIEW OF CHINA'S TECHNOLOGY IMPORT WORK

Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 17 Oct 85 p 2

[Article by Liu Hu [0491 3275]; vice director of the Technology Import-Export Economic Trade Bureau: "A Brief Discussion of Our Country's Technology Import Work]

[Text] The subject of technological imports and exports encompasses a broad scope, and in one short article it would be impossible to give a complete introduction to China's technological import and export work. Therefore, we will only explain some of the major issues that are of particular interest to our overseas readers.

Vicissitudes in Our Country's Patterns of Importing Technology

In China, technology importation refers to the obtaining of patents or other licenses for proprietary rights, sole transfer of technology, and the provision of technological services. It generally takes the form of obtaining trade licenses, consulting and technological services, cooperative manufacturing and getting the product-manufacturing technology, management and administrative technologies, and other such "software" from abroad. As far as any plan of importing "turnkey installations," production chains, or other such programs whose primary feature is the purchase of "hardware" is concerned, some of these programs include the transfer of some technology and thus constitute a form of introducing technology, but in the final analysis, this particular form varies from those metioned above because its primary feature is that it consists of "importing equipment." International figures on the importation of technology do not currently include equipment.

Since its early days, the People's Republic of China has imported technology. But at that time the major thrust involved the importation of "turnkey installations" to obtain technology, and this pattern continued until the late 1970's.

Importing "turnkey installations" indeed was a major help in establishing and filling in the gaps of our country's industrial base and in increasing its productive capacity. But not that our country has built up a relatively complete industrial complex and has a definite corps of technologically trained individuals as well as a definite mechanical processing capacity, and

in light of the pressing need to improve hundreds of thousands of enterprises, it no longer suits our developing needs to continue the simple massive importation of complete sets of equipment or of individual machines. It is neither desirable nor realistic.

Since 1979, when our country began instituting the policy of enlivening the domestic economy and opening up to the West, a changing situation has necessitated that we make appropriate changes in our approach to the issue of importing technology to serve economic construction better. This is to say that our nation's future economic development depends to a great extent on the technological improvement of existing enterprises in order to ensure that these enterprises satisfy market requirements by producing high-quality goods economically and efficiently. Thus, we actively advocate and encourage domestic enterprises to adopt a variety of forms of technological importation that involve the current international license trade.

Our country's first license trade agreement signed in 1975 was for the manufacture of industrial steam turbines. In the 6 years between 1973 and 1978 we utilized the nation's foreign currency to sign a total of 26 such contracts whose primary form of technological importation was that of "software." In the 6-year period between 1979 and 1984 we signed 533 contracts. The number involved increased 19.5 times over those of the previous 6-year period. Positive results have already been seen in the vast majority of these contracts, like projects to develop rice seedlings in large greenhouses, concrete asphalt, small-scale rough-casting equipment, electric welding machines, sealers, etc. Due to the importation of "software" technology, there has been a marked improvement in the quality of a number of products, product variety has increased, and there has been a clear increase in economic benefits within enterprises.

At the same time, approval procedures have been greatly streamlined, and greater autonomy accorded to local areas and individual enterprises. Prior to 1978, the work of planning and approving technology imports was basically concentrated in the various bureaus of the central government. But in recent years, the authority to approve technological imports has been extended in various degrees to provinces, autonomous regions, and municipalities directly under the central government, open seaboard cities, SEZ's, and cities with unique economic programs. Within the parameters of authority, they may approve of plans themselves and report them to higher authorities for the record. As a result, there currently is unprecedented activity in economic and technological cooperation between the local areas and foreign interests.

Prior to 1978, our country had only one corporation that engaged in the business of importing technology--the All-China Technology Import Corporation. In the years since 1979 with the approval of concerned bureaus, a great number of industrial-trade corporations, trust investment companies, and local companies have been established. For instance, a number of large enterprises like Anshan Iron and Steel, the No 1 Automobile Plant, etc. have set up their own industrial-trade companies which handle the work of importing and exporting technology and products. According to preliminary statistics, there are approximately 100 different kinds of existing companies that are engaged

in importing technology, and this will be an important help in stepping up the number of technological imports in our country.

Perfecting Legislation, Safeguarding the Smooth Development of Technological Imports

In order to ameliorate the situation of imperfect economic legislation, and to create a positive environment for economic legislation, and to create a positive environment for economic and technological cooperation, starting in 1978 our country has issued a number of laws regarding joint-venture enterprises between Chinese and foreign interests as well as the various detailed rules and regulations of their implementation, tax laws for foreign enterprises and the detailed rules and regulations of their implementation, personal income tax laws and the detailed rules and regulations of their implementation, and national and local regulations. On 23 August 1982 our trademark law was issued, and the patent law also went into effect on 1 April 1985. The implementation of these two laws marks a great achievement in our country's economic legislation. Recognizing the proprietary rights of industry in a legal form proves that our system of industrial proprietary rights is improving daily. In November 1984 our country decided to join the "Paris Proprietary Rights Accord." Moreover, on 19 March 1985 when it took effect, our country assumed its international responsibility to safeguard the proprietary rights of industry.

As far as proprietary technology is concerned, since not every country has specific laws in this area, the kinds of protective measures that each country takes in practice vary.

In the past, we have normally had security provisions in our contracts to ensure that transferred technology not be divulged or disseminated. In the "Regulations Regarding the Management of Imported Technology in the PRC" issued on 24 May 1985, there is a clear assumptin of the responsibility to safeguard the trade secrets of transferred technology. This shows that we have accorded both legal recognition and protection to the proprietary technology of the supplier. For example, three different customers in our country signed technolgy transfer contracts involving the transfer of hydrofluoric-acid alkylization technology with America's Phillip Petroleum Company at the same time, and we have signed two contracts involving the same kind of low-pressure electronic-technology transfer with an Eastern European company. There are many such examples. It is not difficult to see from these two examples that we not only extend protection to industry's proprietary rights but also accord a complete safeguard to the security of technological trade secrets as well. In China there is no such thing as one company introducing technology to be enjoyed by 100 companies nor of the arbitrary dispersement and use of imported technology.

At present our government has signed investment safeguard agreements with the governments of Sweden, Romania, the Federal Republic of Germany, Belgium, Luxembourg, France, Finland, Norway, Italy, Thailand, Denmark, and Holland and is in the process of negotiating investment safeguard agreements with the governments of Japan, the United Kingdom, the United States, Switzerland, Austria, and Kuwait. Our government has concluded agreements to ensure

against double taxation and tax evasion with the governments of the United Kingdom, the United States, France, Japan, Belgium, and the Federal Republic of Germany, and of those, the agreements with the United Kingdom, France, and Japan have already gone into effect.

As a recipient of technology, Chinese enterprises are also concerned with the issue of whether or not the technologically licensed party can manufacture products that meet contractual requirements, including product standards, and whether production quantities can meet planned targets. This kind of concern is understandable, because during the negotiations for technological transfer, the receiving party has no way of fully understanding the fine details of such technology. This is especially true in the case where proprietary technology is involved. Thus, the recipient is in no position to render a precise assessment based on the reliability of such technology before a contract is concluded. With this type of technology it is only during the actual manufacturing that its product value is determined. In other words, before this stage is reached, the receiving party must bear the risk.

As a result, our attitude is that if the licensing party believes its technology is reliable, then it should extend guarantees to ensure that normal technological functions outlined in the contract work when the licensee operates such technology correctly.

This kind of requirement from the receiving party is not really harsh, and with regard to the licensing party, it is not really difficult to achieve. Of course, we are not calling for licensing parties to issue unconditional guarantees; in fact, it would even be possible to require that the licensee issue a guarantee that it will operate the technology properly.

As far as the issue of how to resolve potential encroachment from third parties is concerned, our position is that the party who is transferring the technology should guarantee that it be the sole holder of transfer rights and have the authority to transfer such technology. At the very least, this party should guarantee before a contract is signed, that to the best of its knowledtge, it has not violated theproprietary rights of any third party. This is because objectively speaking, the possibility of a violation of rights does exist. In the event that such a case arises, it would result in litigation and the assumption of economic responsibilities incurred. As soon as this kind of situation arises, we believe that the first priority should be for both sides, the supplier and the recipient, to cooperate closely and put forth joint efforts to resolve the dispute. Yet since the technology belongs to the supplier, the supplier should take the dominant position in such cases, and the recipient should take active measures in coordination to solve the problem of such violations. Since it would only be through the use of transferred technology from the licensing party that the licensee would suffer economic loss, the recieving party would require that the licensing party extend reasonable compensation in the event of such a situation occurring; this requirement is fair and reasonable.

We hope that both sides involved in technological transfer will expend every effort to take every realistic and feasible measure to ensure that the imported technology will take root in the target country. If importing

technology can succeed in bringing about a progressive increase in domestically manufactured goods and in improving our past dependence on imported raw materials and spare parts to carry out production, then this kind of economic and technological cooperation will enjoy a long and steady development.

Issue of Compensation in the Transfer of Technology

With regard to the issue of the costs of transferring technology, we have always believed that since technology is a special kind of commodity that can be exchanged, it has a definite value. The transfer of the authority to utilize the course deserves remuneration and is not something that should go without remuneration. The recipient must tender a reasonable amount to the transferring party as compensation for the transfer of technology.

As to the form of such payment, there is no absolute prescription outlined in the "Regulations Regarding the Management of Imported Technology to the PRC." We encourage the adoption of a variety of flexible methods. Compensation could be paid in one lump sum, or it could be paid in accordance with the success of product sales on the market or with a method of downpayment followed by payment of the balance. The issue of what kind of payment schedule or form is best is something to be decided by both parties in negotiations. No matter what form cmpensation may take, it must be based on the principles of bilateral equality and mutual benefit.

Main Areas of Our Contry's Future Technological Imports and Technological Exports

Our country's future economic development lies for the most part in the areas of energy development, geological exploration, transport-shipping, electronics, communications, mechanics, etc.

During the period of our Seventh 5-year Plan, with the exception of a few large-scale key projects, we will be improving existing enterprises in a planned manner. The prime thrust will be concentrated on improving product quality and variety, conserving energy, and reducing the depletion of raw materials to solve problems of environmental pollution, improve management and administration, and improve the overall economic benefits of enterprises. These areas delineated above are just the areas in which our country's future imports of technology will be concentrated.

In recent years our country has exported some technologies like oxygenator heat radiator technology, hybrid rice, top combustion blast stoves, coal blast furnaces, etc. These technological items were all researched and developed domestically. Our country's exports of technology are yet in a prelimanary stage but forecasts show that there will be a great deal of expansion in the future.

We have consistently held that international technological transfer is not a simple one-shot business deal but rather a matter of long-term cooperation. We actively advocate the development of economic and technological cooperation with all countries of the world on the basis of equality and mutual benefit.

We welcome foreign enterprises to transfer technology to our country, to invest in our country; we encourage joint venture enterprises, cooperative enterprises, or independently managed enterprises. Whatever form investment may take, we welcome it on all fronts.

In continuing to expand cooperation with large companies, we are also currently actively expanding cooperation with small to medium-sixe foreign enterprises.

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CSO: 4008/2016

KEY POSITIONS GIVEN TO SCHOLARS RETURNING FROM ABROAD

Shanghai JIEFANG RIBAO in Chinese 18 Nov 85 p 1

[Article by Jia Baoliang [6328 1405 5328]: "The Shanghai Institute of Organic Chemistry Emphasizes Promoting Middle-aged Experts"]

[Text] At the Shanghai Institute of Organic Chemistry, Chinese Academy of Sciences, a host of key scientific researchers who returned to China in the 1980's after studying abroad have assumed important positions in scientific research and management, serving as a vital link between the past and future.

Other than Director Huang Weiyuan [7806 4850 0997], a veteran scientist, the current deputy directors of the institute, Wang Zhiqin [3769 1807 0530], Dai Hangyi [2071 5887 5030] and Hui Yongzheng [1920 3057 2973], are all middle-aged key scientific researchers who returned to China in 1982 or 1983 after studying at Columbia University in the United States, Manchester Polytechnic in Britain and North Carolina State University in the United States, respectively. Of the 24 chiefs and deputy chiefs of the institute's 17 research divisions, more than half have studied abroad. Since 1978, the Shanghai Institute of Organic Chemistry has successively sent over 80 outstanding young and middle-aged key researchers as visiting scholars to such nations as the U.S., Japan, Britain, the Federal Republic of Germany [FRG] and Sweden where they work and study for a short period of time at appropriate research institutes and universities. Overseas sojourns and studies have broadened these researchers' vision, stimulated their academic ideas and helped them understand and grasp the latest science and technology in the world and their development trends.

These outstanding middle-aged key scientists who have recently been put at the helm of the research institute and its divisions have a solid grounding in their fields in both basic theories and professional knowledge, coupled with innovative ideas and a pioneering spirit in scientific research management. During their stay abroad, several of the newly appointed research division chiefs were so impressed with the working efficiency, management methods and scientific research procedures they saw that back in China, they came up with a series of scientific research reform proposals, taking into account the country's circumstances, and submitted them to the Shanghai branch of the Chinese Academy of Sciences and the former leadership of the institute. After they themselves entered the ranks of leadership, they have taken a well-

coordinated set of effective measures, with tacit understanding and cooperation, in an effort to map out a new Chinese road to scientific research management.

A host of veteran scientists who, as organizers, leaders and pioneers, have been instrumental in the development of various specialties at the institute, now magnanimously let the middle-aged researchers take over their responsibilities and oversee the work in a particular research area, a move which shows their breadth of vision. Wang You [3076 3731], the 75-year-old honorary director of the institute and China's celebrated organic chemist, has voluntarily retreated to the second front. Huang Jingjian [7806 2417 1017], Xu Jiecheng [1776 2638 6134] and Qian Ruiqing [6929 3843 0615], whom Wang You had supervised while they were graduate students, have taken up new positions as chief and deputy chief of a research division and head of a research group, upon returning home from Cambridge University, the University of Texas and the Max Planck Biochemistry Research Institute in the FRG, respectively. They are now playing an organizational and leadership role in such fields as organic chemistry and protein chemistry. During leadership changes in the research divisions, Zhou Weishan [0719 4850 0810], a 62-year-old research fellow and formerly director of the No 1 Research Division, stepped aside on his own initiative in favor of associate research fellow Chen Yuqun [7115 3022 5028], who just returned to China after studying at Stanford University in the United States. To nurture the new leaders' skill in international intercourse, veteran scientists like Huang Weiyuan are doing their utmost to provide opportunities for them to gain exposure to international scientific activities. Huang Yaoceng [7806 5069 2582], an organic chemist who was originally named chairman for the Chinese side at an international organic chemistry conference, recommended to the conference organizing committee that Lu Xiyan [7120 3556 3508], associate research fellow and the newly-appointed head of the No 9 Research Division, take his place instead.

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CSO: 4008/2040

COMMENTARY ON CONCERN FOR STUDENTS RETURNING FROM OVERSEAS

Shanghai JIEFANG RIBAO in Chinese 18 Nov 85 p 1

[Commentary: "Put to Good Use the Expertise of Personnel Who Have Studied Abroad"]

[Text] In accordance with the needs of the four modernizations, China in recent years has successively sent a large number of people overseas for further studies or to conduct academic exchanges. Entrusted with an important mission by the country and the masses, these people work and study diligently abroad. Not only is their vision broadened and their thinking stimulated, but they have also gained access to the world's latest scientific and technical information and mastered advanced knowledge and methods in scientific research management. By the time they return home, they are bursting with enthusiasm to serve the nation and cannot wait to make themselves useful in a big way. They make up a vital new force on the scientific research front, a mainstay in scientific and technical work which serves as a link between the past and future. Actually many returning scholars have assumed key positions as a result of the concern of leaders and the support of the older generation of scientists. Not only can they give play to their talents, intelligence and expertise, but they are also "sowing seeds" and "tilling the land" in scientific territory yet to be explored. The report in today's JIEFANG RIBAO on the Shanghai Institute of Organic Chemistry bears powerful testimony to this.

However there are many returnees who have not been able to put their knowledge to work as they should after they completed their studies abroad and came home. The reasons for this state of affairs are several. In some cases, their research topics have been taken over by other comrades. In other cases, the country does not yet have the resources to launch research in their areas. Some researchers' topics have not been given priority. There are also cases where a researcher's ability and potential have not been correctly evaluated. So on and so forth. The Science and Technology Commission of Shanghai once did a survey and learned that not an insignificant portion of returnees have not been able to make full use of their know-how. Denied opportunities to put their expertise to good use, some researchers have given up their specialties, changed careers, struck out on their own, or even gone overseas. Clearly this is a waste of talent, a loss which should not occur in scientific research.

In the general interest of the four modernizations, we must see that scientific research personnel are taken care of when they return to China after completing their studies overseas, and do our utmost to ensure that their expertise is fully used. Toward that end, we must first have a correct understanding of their value. Some people look askance at them; they believe that the researchers "went abroad in order to enhance their social status" and that "there is nothing remarkable about them." Of course we must not assume a person is superior just because he has studied abroad. But we must be realistic enough to admit that there are wide gaps between China and the scientifically advanced nations as far as things like scientific research standards and conditions are concerned. The reason we send people abroad to study is exactly because we want them to learn the latest stuff so that when they come home, they can help bridge those gaps. And many of the people we send abroad are indeed brilliant individuals. We must use what they have learned. Is it not a terrible waste if we ask them to learn something and then refuse to put it to use? Second, we must be solicitous about their thinking, studies, work and life, listen attentively to their views and opinions, help solve some of their problems which can and should be solved, create a good working environment for them and enable them to make use of their knowledge. How else can they give play to their enthusiasm? Moreover, we should do our best to guide them to integrate their specialties with the practical needs of the four modernizations, emphasizing applied research without sacrificing the necessary theoretical research, and help them gear themselves up for and contribute to economic development. When their demands cannot be met for the time being owing to various resource constraints, we must also explain to them at length and work hard with them to overcome the constraints.

Qualified personnel are basic to the achievement of the great cause of the four modernizations. We must cherish them, including people who have returned home after finishing their studies abroad. Party and administration organizations in the scientific and technical system must come to grips with this task as part and parcel of their job of implementing the policy on intellectuals and promoting science and technology, and do so effectively.

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CSO: 4008/2040

VICE GOVERNOR REPORTS ON FUJIAN SCIENCE REFORMS

Fuzhou FUJIAN RIBAO in Chinese 10 Sep 85 p 1

[Article: "Reform the Science Education System to Obtain Victory by Knowledge and Realize the Strategic Goals of the Next 15 Years; Vice Governor Chen Mingyi Made a Report at a Meeting of Specialists, Mayors and County Magistrates from the Whole Province"]

[Text] On the afternoon of 8 September, Vice Governor Chen Mingyi [7115 2494 5030] made a report on the topic "Reforming the Science Education System and Vigorously Developing Fujian's Economy" to a meeting of specialists, mayors and county magistrates from the whole province. Participating in the meeting were more than 800 persons, including Governor Hu Ping [5170 1627], Vice Governor Wang Yishi [3769 0001 1102] and the responsible comrades of directly related provincial departments.

Chen Mingyi said that in March and May of this year, the Central Committee held first a national meeting on scientific work and then a national meeting on educational work, making decisions related to the reform of the scientific and educational systems. To carry out fulfilling these two "decisions," is the major duty of all levels of government and is the important professional responsibility of the specialists, mayors and magistrates.

He said that in the past 5 years, with the common diligent efforts of the whole province's people, our province's economy has begun to show a special new aspect of steady development. Whether or not the strategic goals of the next 15 years can be achieved is linked to the size of the aftereffects of this development. And the size of the aftereffects of economic development is more and more decided by the quality of workers and by the quantity and quality of intellectuals. Whoever can grasp advanced scientific knowledge and has outstanding talented persons will be able to stay far in the lead, and the aftereffects of his economic development will be inexhaustible.

Chen Mingyi urged that 9-year compulsory education be further realized on the base of universal primary education. For the province as a whole, it is planned to proceed in two steps: first, by 1995, that the number of students graduated from elementary school who go on to junior high school

will exceed 90 percent; second, that all children and youths of suitable age will be able to receive junior secondary education. Secondary vocational-technical education must be strongly developed; our province ought to strive by 1990 to have the number of students enrolled in higher secondary vocational-technical schools equal or exceed the number enrolled in general secondary schools. We must do a good job of building up the ranks of teachers.

He said that to reform and develop higher secondary education, we must from now on pay close attention to advancing reform of the educational system, and speed up the development of higher secondary education, nurturing a large number of all kinds of talented persons with ideals, with morality, with culture, with discipline, able to adapt to the requirements of modernized scientific cultural development and the new technological revolution. We must diligently handle both broadcasting the television university and all kinds of adult higher secondary schools, making the path of the television university to the farm villages and rural enterprises broader and broader, to completely realize the advantages of the television university's instruction. The higher self-study examination will begin in the next half year, and will in the future add finance and eight other occupations, and it will follow the course of economic development to add operating businesses, architecture for personal use, computers, industrial management, and other occupations. The horizontal contacts between higher secondary schools and society must be strengthened, by continuing to advocate that the teachers in high schools go out the door of the classroom to develop the mountain areas, to build up the coastal cities and towns and the special economic zones and to provide scientific and technical service to specialized households and individual households.

Chen Mingyi said that we must liberate the productive power of science and technology to aid the development of our province's economy and society. The province is preparing to establish a scientific and technical development fund, to be mainly used to support basic theoretical research, medium- and long-term applied research and soft-science research, to vigorously open up the technology market and aid the conversion of technological achievements into products. The scientific research institutes must gradually "lean on both ends," ordinarily speaking, those doing basic theoretical research must rely on higher schools, those doing applied developmental research must rely on production (or hospital) work units, and vigorously develop an organization for developing commercial technology. Beginning in 1986, relying on technological progress to raise economic efficiency will be a major point of evaluation for enterprises. We must seize a number of "quick and easy" scientific and technical projects to aid the plan for vigorous local economic development (such as the "spark" plan), and seize a batch of technical development projects that are significant for serving as models of and promoting rural enterprises. We must fully pay attention to the introduction of technology so that it is introduced in a planned and organized manner so that it is digested and develops innovations.

Finally, Chen Mingyi stressed that developing and reforming science and technology and education must be an important long-term matter to be handled well by party committees of all levels and the government. We must strengthen leadership to truly handle well science and technology and education.

13044/12828
CSO: 4008/2006

DEVELOPMENT OF TALENTED PERSONNEL IN MOUNTAIN AREAS DESCRIBED

Hefei ANHUI RIBAO in Chinese 20 Sep 85 p 4

[Article by Cheng Ding He [4453 1353 3109]: "We Must Do a Good Job of Developing Talented Personnel in the Mountain Areas"]

[Text] Anhui is a very mountainous province, with the mountain areas occupying approximately one-third of the province's entire area. As a popular saying goes, "70 percent mountains, 10 percent water, and 20 percent land." The economic development of the mountain areas occupies an important position in the province, but development in these areas is slow. Aside from historical factors, an important cause is to be found in the insufficient development of talented individuals. Another reason is that there are few skilled people in the mountain areas, especially those with scientific and technological expertise. A second reason is that a great many scientifically and technologically trained individuals from other areas are not comfortable working in the mountain areas. I believe that in order to do a good job of developing talented personnel in the mountain areas, we must institute certain policies and strong, effective measures to support these areas.

1. We must put reforms into effect in the organizational system and in the cadre structure's way of working with talented personnel. Because of historical reasons, there are currently very few scientifically and technologically trained individuals at every level of the leadership group in the mountainous areas, and this kind of cadre structure is extremely unsuited to the needs of economic development. On the other hand, there are a certain number of mature, effective, fine individuals with scientific and technological training who not only have gone through years of training and have a good theoretical and practical background in science but are quite familiar with the party's and the nation's policies and have definite leadership ability. If we were to choose a number of comrades among them and appoint them to take positions of major responsibility at every level in the leadership structure, then that would indeed bring encouraging progress to our cadre structure. In addition, there are a number of cadres who were brought up doing agricultural work in the mountain areas. They have a rich experience in rural life and are in touch with current conditions, and they are of precious value to us. For the most part, however, they lack modern scientific and technological knowledge and do not know business management techniques. And so a new task facing the party with regard to its construction in the mountain areas would be to establish an educational training system to train party and government cadres in science and technology and in

business management and to produce a body of skilled leading cadres who are trained in directing production, business management, and science and technology.

2. We must expand all efforts in every sector toward support for growth in the mountain areas. Currently, aside from the necessary material support, the prime assistance that is needed is in the support and expertise of skilled personnel and technical support. In the past, when medical teams were dispatched from various government levels to the mountain areas, these people would train a group of local medical workers while they were in the area treating patients. In addition, agricultural technicians who have been sent out have, in the process of spreading advanced agricultural techniques, trained a body of technically skilled peasants. To this day, the mountain people have never forgotten nor ceased to sing the praises of such programs. Instituting a variety of flexible kinds of assistance in every sector for training and technical support could both solve the problem of an insufficient number of technically trained personnel in the mountain areas and help improve the educational level of personnel who already have a basic background. These approaches could create a societal mood in support of the mountain areas, strengthening the sense of honor and responsibility of those involved in mountain area work. With technically trained personnel from other areas, we could institute a fixed-time rotating system, a "personnel-based system," whereby the period of service could be long or short, 3 years, 5 years, or even a bit longer, and except for any case of voluntary extensions, the end date would be honored and these individuals could return home. With elderly retirees, they could return to their home province or stay with relatives.

3. We must institute special policies to encourage intellectuals to go to the mountain regions to put their skills to work. To help solve the practical problems facing scientifically and technologically trained personnel, a compensatory subsidy should be granted to all those working in the mountain areas. In some areas where finances are currently difficult, a system of granting subsidies for certain posts or another suitable approach should be taken. As for such problems as children's schooling, employment, spouses' household registration, etc., they should be given priority. Nowadays scientifically and technologically trained individuals from our province's mountainous areas make up only one-third of all scientifically and technologically trained personnel. Compared with technologically trained individuals from other areas, their educational level lags behind. In this regard, we can take special measures like setting up preparatory courses at secondary schools targeted especially for students of all ethnic groups from the mountain areas, thus strengthening the training of scientifically and technological personnel from these areas. Only in the combined growth of local talents trained in science and technology, together with other intellectuals, can construction in the mountain areas be accelerated. Our party places a great deal of importance on construction in the mountain areas and allocates funds every year toward that end. It would be best to put a portion of these funds toward the development of talented individuals, to improve the work conditions of technological personnel and specialized technical cadres, to expand universal education and education in science and technology, to nurture and train personnel in all specialties, and to make contributions to the economic development of the mountain areas.

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HEBEI PROMOTES SPREAD OF COMPUTER APPLICATION

Beijing GUANGMING RIBAO in Chinese 27 Sep 85 p 1

[Article by Liu Sa [0491 7366]: "Hebei Province Scientific Committee Takes Realistic Step of Emphasizing the Spread of Computer Use; Now Being Operated in Over 1,000 Different Locations, Computers are Helping to Improve Traditional Industry"; first paragraph is source supplied introduction]

[Text] Editor's note: From a practical approach of utilizing suitable technology in inconspicuous ways, the popularization of computer use will be of great significance in changing the look of our nation's backward industry. This experience of the scientific committee in Hebei is worthy of the attention of other areas.

In its consistently practical approach, its enthusiasm for utilizing new technology, and its emphasis on popularizing the use of small computers, the Hebei province scientific committee has achieved a great deal of technological progress and clear economic results in the past 2 years. The number of locations that are utilizing computers has increased from 86 in 14 different bureaus in 1983 to over 1,000 in 24 different bureaus currently, thus greatly expediting the technological improvement of industry throughout the province.

The most important application of computers has been in the development of products that use computers, thus combining electronics and machinery. The province's scientific committee focused its energies on this particular area to counter the technologically backward, outdated machinery and products that lack competitiveness in a number of industries. Since the planning stage, they firmly held to principles that entailed a small investment and good, fast results. Because they were on the right track, and their work was sound, the entire province soon had over 70 different products that used computers. In 1984 the city of Chengde put five of these new kinds of products into production, producing 8 million yuan worth, which resulted in 2.2 million yuan in profits. The No 14 Wireless Plant in the city of Baoding developed a new kind of product whose capacities exceed those of the same type abroad, thus filling in a gap here at home.

Another important application in the spread of small computer use is in the quality control and testing phase in manufacturing. The province's scientific committee chose nearly 100 widely varying items on which to develop models as

a base, cooperated with relevant bureaus, and organized in batches to spread the use, thus accelerating the technological progress of industry. One such example is the provincial science academy's automation of the trail product, "computer-controlled concrete mixer system," which automatically adjusts the proper balance between the input of raw cement powder and the output of cement, thus greatly increasing the quantity and quality of cement.

The scientific committee also organized work in developing a batch of management applications software. Since people have had a taste of it, their enthusiasm for developing and spreading computer use in the entire province has reached an unprecedented high, and quite a few enterprises have put aside funds for such items. A number of enterprises have set up special teams to look into the development and use of computers, and together with the science academy and the united efforts of high-level institutes and universities, our province has formed the core team to develop the application of computers.

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RESEARCH INSTITUTES SHOULD HAVE RIGHT TO CONVEY ACHIEVEMENTS

Beijing RENMIN RIBAO in Chinese 28 Sep 85 p 3

[Article by Luo Kangxiong [5012 1660 7160]: "Research Institutes Should be Given Independent Right To Transfer Results"]

[Text] Following the deepening reform of the scientific and technical system, Shanghai already has a number of scientific research units engaged in applied and developmental research, which have reduced operational expenditures and are gradually changing to assuming sole responsibility for profits and losses. Recently, while attending meetings of leaders of a few institutes, this reporter heard a strong call: both pressure and vitality must be applied to let research institutes have the independent right to transfer their achievements.

The Shanghai Pesticide Institute's Vice Director Chen Xiongfei [7115 7160 7378] discussed his vexations with reporters. In the past, this institute received operating expenses of more than 900,000 yuan each year from the national government, but this year they were reduced by one-third. Where does the research institute's income come from? Of course it relies on transferring research achievements, but resistance to developing this line of work is heavy. The "Kewenling" pesticide developed by this institute has had obvious effects in preventing rice blast. The institute has already given highest priority and most favorable treatment for transfer of this technology's research achievements a factory of the (Dyes and Pesticides Industry Company) for production. At present, the whole country only has two pesticide factories producing "Kewenling," and last year's production was about 100 metric tons of primary pesticide, but the amount needed for the whole national market is at least 500 metric tons. Not a few factories in other provinces and cities have one after another come for visits seeking transfer of these technological achievements but have encountered interference from higher-level responsible departments. He spread open his hands, and said as one with no way out, "They're reducing the operating appropriations, and not allowing the right to transfer research achievements; it's really like wanting a horse to run but not wanting him to eat grass."

This sort of phenomenon is even more prominent in some local research institutes belonging to bureaus or companies. Higher-level responsible departments always stress that research institutes must serve the economic

development of their own line of business. Of course this is beyond a doubt, but, under the premise of satisfying their own lines of business's requirements, if the technological achievements sell and have a market, the products have a sales path, and the distribution points are reasonable, then the research institute should be permitted to have the independent right to transfer its technological achievements. The higher-level responsible departments' sights cannot only be fixed on economic development in one line of business in one place, keeping small accounts, but must see to it that after the technological achievements are transformed into power for production, they can produce economic benefits for the whole society; they should keep large accounts. If the Shanghai Pesticide Research Institute transferred the "Kewenling" technological achievement to more factories, to form an annual production of 500 metric tons of primary pesticide, the institute could obtain more than 2 million yuan a year in technological transfer fees, the factories could increase the value of their production by more than 16 million yuan, the pesticide could be provided to the more than 10 million mu of paddy fields in the whole country, and in one year the economic harm due to blight could be reduced by more than 100 million yuan.

According to what this reporter understands, the higher-level responsible departments are mainly worried about "fertile water flowing away," and establishing a "competitor" who would take their "golden rice bowl." This sort of wanting to monopolize research achievements is impractical. Following the opening of a technology market, if you don't go and occupy the market, others will swiftly make the first landing. The Shanghai Industrial Microbiology Research Institute had as early as 3 years ago successfully manufactured a kind of isoglucase that can be broadly used in the food industry, but a factory within that line of business kept delaying and didn't get on the horse, and the higher-level responsible departments didn't allow the institute to transfer its technology to outsiders, so as a result other research units in the country later occupied the market, with some having already transferred the technology to factories for production, making the first institute's and factory's leaders feel no end of regret.

The prupose of reforming the scientific and technical system is to help scientific research units face economic construction, to transfer more technological achievements foster. Higher-level responsible departments should strengthen their macroscopic guidance of research institutes, and not choose traditional administrative means of giving commands, which tie their hands and feet.

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EVALUATING SCIENTIFIC, TECHNICAL POLICY DECISIONMAKING

Beijing ZHONGGUO KEJI LUNTAN [FORUM OF SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 1, Sep 85 pp 26-29

[Article by Liu Xiaocheng [0491 1420 2052]: "Technical Policies Are Important Policies for the New Historical Period"]

[Text] Beginning in January 1983, the State Science and Technology Commission, the State Planning Commission, and the State Economic Commission jointly organized the study and formulation of technical policies in the 14 areas of energy, transportation and shipping, communications, agriculture, consumer goods industries, machinery industries, materials industries, building materials industries, urban construction, village and small town construction, city and township housing construction, environmental protection, computer technology, and integrated circuits to form the essentials of national level technical policies. With the stimulation of this work, many departments and areas are also studying and formulating technical policies for their own systems and their own regions.

The study and formulation of technical policies on a scale this large is not only the first time for this country, but is not often seen abroad. It is both an important task under new historical conditions, and also work of a creative nature. Looking back at the practice of this enormous project over the last 3 years, it is necessary to both sum up collective experiences and knowledge, and engage in probing for some knowledge that is regular and constant.

I. The Study and Formulation of Technical Policies is an Important Measure for Stimulating Technical Advances and Economic Invigoration

Policies are standards of behavior for mankind. China has always had a tradition of discussing policies. From their personal experience, people deeply understand the importance of policy. But in the past that has primarily meant political, military, and economic policies. Now, the focus of national efforts has changed to building toward modernization, and technical policies have become the "new soldiers" of policy categories, showing well ability or talent, as well as generating important roles for China's technical advancement and economic invigoration.

This job for China's science and technology occurs just at a time of strategic changes. In 1981 the Central Committee formulated new guiding principles for developing science and technology that stressed the coordinated development of science and technology with the economy and society, as well as treating the encouragement of economic development as a primary task, and shifting the focus of research and exploitation to the encouragement of advances in production technology.

Building the Chinese economy is also undergoing a strategic change. One of the important indications is an increase in the respect for the function of science and technology in shifting the national economy to a modern technical base as quickly as possible.

At this time of strategic change, Premier Zhao Ziyang, representing the Central Committee, pointed out that "economic construction must depend on science and technology, and science and technology must cater to building the economy," and also considered it to be a determiner of strategic principles as we invigorate the economy.

How will economic construction depend upon science and technology? And, how is science and technology to cater to economic construction? These are questions that economic circles and scientific and technical circles are deliberating.

Looking overall at the role of science and technology as generated by developments in the economy and society, these are primarily manifested in two forms: one is the application of particular scientific and technical achievements one after another, as in new technology, new techniques, new materials, new equipment, and new products, in production, in society, and in daily life. In this aspect is also included the hard technologies in material form and the soft technologies of knowledge, as with computer software. The importance of that is already known to people. Another form is the soft science that announces complicated policy topics as goals for a modern society, which is currently playing an ever more obvious role in economic and social developments, as well as for advances in science and technology itself.

This phrase "soft science" is a new concept gaining increasing respect internationally in recent years. It uses the word `soft' from "software" to distinguish it from those technical "hardwares" of a material nature; but it is not the same as the soft techniques of technical methods of nonmaterial forms. Soft science uses systems engineering, policy making theories, computer technology, as well as various modern scientific and technical knowledge and methods. These include broad fields within natural phenomena and social phenomena in which to undertake comprehensive study that transcends science to provide a scientific and effective base for the national macroeconomic management, as well as for policies for technical, economic, and social development, allowing them to suit objective rules.

In keeping with rapid developments in contemporary science and technology, economics, and society, the factors that the state must consider when making policy decisions are increasingly complicated. At the same time, in order to achieve any particular goal, the programs and channels from which to choose

are becoming more and more numerous. To ensure the scientific nature, reasonableness, and feasibility of policy making, we must fully respect the role of science and technology, and especially the special function of software science.

The shortcomings of our work in the past have been just because we have not provided a sufficient respect for study of these kinds of overall policies. Because of errors in policy, and because of the issuance of confusing orders in violation of objective rules and of inappropriate management, serious losses have resulted in scientific and technical work and in economic construction, and there has been much grief and pain. For example, without proceeding from the situation regarding natural resources it was planned to change the shipment of coal from the north to the south; to inappropriately convert a large number of coal burning furnaces to oil burning; when there was international stress on "economies of scale," and when iron and steel enterprises were developing toward a larger scale, we still built small iron and steel factories in 1958, etc.

In recent years, China has summed up its historical lessons and experiences to begin paying close attention to the study and formulation of policies.

Technical policies are an important basis for a country in regard to overall planning of technical developments in a field and for economic construction. They can both guide scientific and technical planning and the writing of economic and social development plans, and can as well guide the taking on of key scientific and technical problems, technical reform, technical importing, and construction of key locations. They can also guide adjustments to, transformations of, and development of production structures, expenditure structures, and technical structures, which will allow them to proceed along a track in keeping with objective rules.

Under the new conditions of the restructuring, state organs must change their modes of management that are solely concerned with setting quotas, outlining programs, budgeting investment, and dividing goods and materials. They must pay closer attention to the research and formulation of policies, be better at using policy measures, and even better at implementing governmental management functions.

Therefore, studying, formulating, and executing technical policies is the same as studying, formulating, and executing political and economic policies in that it is an important guarantee for China's smooth building toward modernization.

II. The Significance of Technical Policies and the Objects of Study and Chief Content

Scientific and technical policies are multilayered. While there are overall strategic, principled, and comprehensive policies, there are also scientific policies and there are technical policies. This paper is concerned with particular technical policies in the realm of building up production, not with comprehensive technical development strategies.

Technical policies are provisions of a policy nature for a nation that guide in an overall manner technical and economic development within a certain field, and that are aimed at stimulating economic development through technical advances. However, these are limited to technical development itself. This is because technology broadly penetrates to labor, the subjects of labor, and to the tools of labor, which are the three key elements of production forces, and it has an extremely close relation with economic and social development. The final goal for technical exploitation is to stimulate development of the economy. Moreover, the whole process of a technology from the beginning of its exploitation to its industrialization, application, and commercialization is always in contact with production activity. Therefore, to be divorced from production activity and economic development, to independently seek technical development, or to be divorced from advances in technology, independently considering the development of the economy, it will in either case be difficult to obtain good results. The three elements of technology, the economy, and society must be considered together.

It is just because of this intimate relation between technology and the economy that determines that technical policies will have "overlapping" policies, including both the substance of technical development and also the subjects of construction activities for production. These all constitute policies in which technical development and economic development ought to be jointly revered.

There is both a distinction and connection between technical policies on the one hand and industrial and economic policies on the other. And in the policy system that ought to be followed in building the economy they will supplement each other. We must appropriately handle the relation between these three things.

Economic policies are chiefly policy principles that determine things like prices, finance, banking, and trade.

For the most part, industrial policy answers questions about industrial structures and the overall arrangement of the economy, and has characteristics that transcend professions. For example, how are the first, second, and third industries to develop in coordination, the proportional relation between each profession within an industry, and the focus and preferential areas for development. Formerly, the phrase "industrial policy" was not often used in China, but in overall policy making many principles were raised that were associated with production policy categories. For example, actively developing the third industry, adjusting the proportional relation between heavy and light industries, and preferential development of energy and transportation and shipping industries. Currently, systematic study of our industrial policies is quite urgent.

Questions related solely to economic policies and to industrial policies do not need to be addressed in technical policies. However, because there is a very close relation between technical policies on the one hand and industrial and economic policies on the other, the divisions between the three are sometimes difficult to see clearly, nor need they be, for in content they may and indeed must overlap appropriately.

The study of China's technical policies began not long ago, and are still at the stage of exploration. The precise significance and chief subjects of technical policies will gradually be perfected and clarified with future practice and study of policy theories.

We can see from the reality of recent years that the substance of technical policies chiefly encompass four areas:

1. Development goals. Technical policies must first determine appropriate technical development goals. Proposing goals for technical development must suit the needs of goals for economic development, and ought to objectively analyze trends in world technical developments, as well as proceed from the actual situation regarding a country's own technical capabilities and economic and social conditions.

2. Industrial structures. The structure of an industry includes its production structures, product structures, and technical structures. The situation, technical level, and capacity for development of the production forces for this industry, and the need by society for its products, ought to be seriously investigated and analyzed. The mutual relations, reasonable proportions, scale, overall arrangement, speed and sequence for development, and technical structures, as well as developmental directions for chief products and principles for expenditure should all be determined for the various production forces and production modes within an industry according to objective rules and based on scientific methods and measures.

Advanced and reasonable industrial structures will stimulate technical advancements and the development of production. Backward and idle structures will then become obstacles to development. Technical policies in more than 10 fields already formulated by our country have produced a series of important provisions in these areas. For example, for transportation and shipping they stress adjustment of transportation and shipping structures, taking full advantage of various modes of shipping, and establishing a modern comprehensive shipping network. In the area of energy development, the stress is on vigorously exploiting water power and nuclear power, and on improving the current irrational structures for primary energy. In communications, it is to convert as quickly as possible from the chief modes currently used like analog communications, crossbar exchanges, and cable transmission to digital communications, programmed exchanges, and fiber optic transmission. In metallurgy, we want to vigorously develop low alloy steel, alloy steel, and economic steel products, and to improve the proportion of plate, pipe, and strip among the quantities of steel products. Regarding fertilizer, we will strive for the effective proportions of nitrogen, phosphorus, and potassium in fertilizer throughout the country to be adjusted from the 1983 ratio of 1:0.31:0.05 to 1:0.6:0.3 by the end of the century. In the area of consumer goods, they must be appropriate to the growth of the people's buying power, and we will develop universal and medium and high grade products to suit the different needs of people. As for urban development, we will strictly control the scale of large cities, reasonably develop medium size cities, vigorously develop small cities and towns, form reasonable city and town systems, etc., all based on the conditions in different areas.

3. Selection of technology. Selecting the directions for technical development, which is to say what technology will be used, which technology will be developed, which technology will be restricted, and which technology will go out of use. In keeping with developments of technology, various technologies could be chosen to solve the same problems. For example, train engines ought to replace steam driven with electric power or internal combustion. During the current transition period, as we use our steam engines well and improve them, we ought also to develop electric powered and internal combustion engines and limit the number of steam engines produced to ease the eventual complete end of production.

4. The lines, channels, and measures for stimulating technical advances. In this area is included a very broad number of subjects. For example: the importation of foreign advanced technology; use of new and developing technologies to speed up the renovation of traditional industries; carry out specialized, socialized production and cooperation; promote principles of standardization, serialization, and universality; perfect quality control institutions and systems; apply advanced technical methods and modernize management; implement reasonable programs and optimized plans for overall planning, comprehensive development, and coordinated construction; perfect and enhance the basic structures for supporting technology and production development, and improve the quality and level of technical equipment; use resources and energy reasonably and effectively; protect the ecological environment; enhance measures for the industrialization, application, and commercialization of technical achievements; lines and technological processes for important techniques in key production links; etc.

The matters brought up above certainly do not have to be answered one by one, but rather corresponding measures should be proposed based on the characteristics of a particular field and existing problems and by getting control of the overall chief contradictions that affect development of that industry. For example, the structures of China's machine industries are very large, having more than 3 million machine tools, standing in second place in the world, and there are also many kinds of products. However, the most prominent problems awaiting resolution are that product quality is deficient and performance is backward. Because of this, in technical policies for the machinery industry, "maintaining first rate quality" is the first line, they stress active use of international standards, perfecting quality assurance systems, and step by step implementation of a production licensing system beginning with basic devices, basic technology, and basic machinery.

III. Principles that Must be Adhered to When Studying and Formulating Technical Policies

In the process of researching and formulating technical policies we must especially stress the following principles:

1. To determine the goals for technical development in a practical way. It was proposed in China during the 1950's that we would catch up to and exceed advanced world standards for science and technology within 10 or 20 years. That goal was not realistic, and it could not only not be implemented but

caused a deviation in direction for China's science and technology. The consequences were that on the one hand it wasted a great deal of manpower and material in blindly seeking to "meet and exceed"; in another sense, a large number of technical matters in building production that urgently needed resolution were not sufficiently taken notice of because they "did not pertain to advanced world standards" and so were not resolved for a long time. We ought to seriously learn from these lessons of "high quotas." From the point of view of the current situation for China's technical development and the conditions for further development, the overall situation for China's technical development still lies at the stage of studying and mastering the advanced accomplishments already existing in the world. With great effort it will be possible by century's end to fundamentally disseminate in China the advanced production technologies that were common in developed nations in the 1970's and 1980's and that suit our needs, and these will constitute a technology system that has Chinese characteristics. But this is only an overall goal. Because there are great differences in the conditions of each profession and industry, we cannot nor should we make equal demands. As technical policies are formulated in each field, we must make specific analyses, and propose particular goals that suit reality.

2. Technology and the Economy Are Closely Integrated. We are a developing nation, whose technical capacities and financial and material capabilities are limited. The selection of technology must not purely consider the degree of advancement. We ought to base it on our national situation, and under the general premise of seeking technical advancement analyze in an integrated way technical capacity, economic capacity, natural conditions, and social conditions, and especially to make a comprehensive evaluation of the degree of technical advancement together with a reasonable degree economically and socially, to consequently formulate reasonable and suitable technical structures.

3. Comprehensively and Systematically Research Questions Proceeding from the National Overall Advantage. In formulating technical policies, we cannot independently study problems microscopically and partially, and even less should we proceed from the point of view of advantage to a particular unit, or department, or region. Rather, we ought to proceed from the nation as a whole to carry out systematic qualitative study and quantitative analysis, taking as a principle optimization of overall results. For example, within the transportation and shipping industry there are railroads, highways, waterways, and the airways, and if we were to consider each mode of shipping, each would like to build a fully developed network. But to see this from the whole picture of transportation and shipping, it is obvious that it would be more reasonable to construct a comprehensive shipping network that can give full play to the advantages and mutual support and complementing of the various modes of shipping.

4. Adopt a Democratic Policy Making Program and Ensure the Scientific Nature of Policy Making. Summing up these previous lessons, we see that an important reason that there have been errors in policy making is that we have lacked a program of democratic policy making. Formulation of a particular policy has never undergone full study and debate, but rather has been decided upon with the rap of a gavel.

On this occasion of formulating technical policies, there was soft scientific study and several stages of drafting the document with debate, requests for the opinions of each department, and revisions of the document. There were several thousand specialists and leading cadre who participated in the research, debate, and drafting of the more than 10 technical policies. In the process of studying and debating technical policies, democracy was advocated, there were no restrictions from existing policies, the process was not restricted to decision makers or decision making organizations, contradictions were not avoided, all voices were heard, and the wisdom of the group was pooled. There was especially full discussion of problems for which there has long been controversy. Many problems were able to reach a rather unified opinion after comparisons of all sorts of plans. For example, whether China should build super highways has been debated for years. This time, after study of all sorts of plans and quantitative analysis, a conclusion was finally reached: for sections of road where 10,000 vehicles pass daily it is reasonable to build super highways.

Formulating technical policies is a new matter for China, and although we have taken a gratifying step, there still exist many problems requiring penetrating consideration and study. Any policy has its limits in time and space. For this reason technical policies must maintain a certain flexibility and capacity for a viable response. In the process of carrying out technical policies we ought to pay close attention to new trends in technical and economic developments, and proceeding from reality, we ought to do a good job with information feedback and adjusting and revising policies in a timely manner. This will allow constant improvement, and will allow them to play their rightful role in building China's socialist modernization.

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CONSIDERATION OF THE EFFECTS OF THE S&T REFORMS

Beijing ZHONGGUO KEJI LUNTAN [FORUM ON SCIENCE AND TECHNOLOGY IN CHINA] in Chinese No 1, Sep 85 pp 37-39

[Article by Ming Yanhua [2494 1693 5478]: "A Major Strategic Policy Decision"]

[Text] The "Resolution Regarding Restructuring of the Science and Technology System" publicly announced by the CPC Central Committee in March of this year (called the "Resolution" hereafter) is yet another major strategic policy decision after the economic system restructuring resolution that signifies that the great enterprise of China's restructuring has revealed new chapters. After announcement of the "Resolution," reactions both foreign and domestic brought extended and ardent responses. At present, our science and technology [S&T] departments and related departments have enthusiastically thrown themselves into the work of restructuring in accordance with the requirements of the "Resolution." We may predict that implementation of this resolution will generate a far ranging effect on building China's modernization.

"We Must Handle This Continuation Well"

System Restructuring is a major event for the future and vitality of China's building toward modernization. Restructuring permeates the entire process of building toward modernization, and it permeates every line and every profession. The enormous success of the restructuring of the rural economy added a great deal of vitality to the development of agriculture. The "Resolution Regarding Restructuring of the Economic System" passed by the 3d Plenary Session of the 12th Party Central Committee in October 1984 signified a gradual full scale expansion of restructuring of the economic system with a focus on cities. This was another grand and courageous undertaking as our party pushes ahead with building toward modernization. Then, what connection is there between reform of the science and technology system and economic system restructuring and economic development? The Central Committee clearly pointed out in the "Resolution Regarding Restructuring of the Economic System" that: "Science and technology and education play a very important role in the development of our national economy. With advances in reform of the economic system, reform of the science and technology system and of the education system will more and more become a strategic task in urgent need of resolution." The Central Committee leading comrades went on to point out that reform of the science and technology system is a continuation of reforms of

the economic system, a sequel that must be handled well. As the economic system changes, the system of science and technology must also change, which is certain to cause the science and technology system to adapt to the new economic system that is developing a socialist commodity economy, for otherwise China has no hope. The "Resolution" was formulated just to suit the needs of developing a socialist commodity economy.

Conscientiously relying on and using commodity currency relations and using the laws of value and the marketplace system is one of the key subjects for the reform of the economic system. And these important topics similarly permeate the "Resolution" on science and technology restructuring. Restructuring the funds allocation system, implementing a technology contract system, as well as opening up technology markets and quickening the commercialization of technical achievements are all particular manifestations of a conscientious reliance on and use of commodity currency relations and use of the laws of value and the marketplace system. And, to a very great extent, use of commodity currency relations, the laws of value, and the marketplace system links the reform of science and technology to the economic reform, and connecting those together further intensifies the relations between science and technology and the economy.

If science and technology is divorced from the economy, that would form what is called "two coverings," which has for a long time been an important factor affecting the development of our economy and our science and technology. The strategic principle "economic construction must rely upon science and technology, and science and technology must be oriented toward economic construction" was proposed just for this sort of situation. But if we are to resolve the problem of "two coverings," sole reliance upon administrative measures, or upon efforts in one direction only, will not prove effective, we must make efforts along the lines that Comrade Xiaoping has said, and "work along both lines" of the economy and of science and technology. Reform of the economic system is just now allowing the economic construction in our country to generate internal stimulation and vitality that relies upon and accepts science and technology. The unprecedented urgent requirements for science and technology that have already or are currently appearing in the majority of cities and towns are manifestations of just this kind of internal stimulus and vitality. Restructuring of the science and technology system will thus allow the majority of scientific and technical units to generate stimuli and vitality in the direction of economic construction. In this way, the restructuring of the economic system and the restructuring of the scientific and technical system will be mutually fitting and will help each other forward, thus writing out to a great degree a complete chapter on restructuring. Actually, only if reform is carried out in these two aspects can a situation of "you consider me, I will rely on you" for science and technology and economics develop in coordination, can they complement each other, and can they have the strength to promote our country's building toward modernization.

"Arouse the Armies and Get the Economy Going"

After the 3d Plenum of the 11th Party Central Committee resolved to change the focus of the work of the whole party to building the economy, the Central

Committee has continued to stress the concentrating of energies into building the economy, and to get the economy going, which is at the center of all work, and it is what the highest levels of government and what work of all aspects must take as its core without exception, and must serve this core. The "Resolution" strongly pointed out that "the work of science and technology must tightly enclose this core and serve this core." We can see that this is the most fundamental starting and lodging point for restructuring of the science and technology system. And all the reform measures proposed in the "Resolution" are all to ensure that at the level of the system science and technology better encircle this core and better serve this core. The reasoning is quite simple. If we cannot get on with our economy, then nothing else is worth talking about. This is the conclusion reached by our party by summing up the bitter lessons of history, and is also a most fundamental strategic change adopted by our party for this new age in complete accordance with Marxism. More than a hundred years ago, when Engels was commemorating Marx, the revolutionary teacher, and evaluating his enormous contributions, he once incisively pointed out that "it was just like Darwin discovering the rules of evolution in the organic world, where Marx discovered the evolutionary rules of the history of mankind, namely, that throughout the ages one simple fact has been concealed by a confused and miscellaneous state of knowledge: people must first eat, drink, be clothed, and have shelter before they can engage in politics, science, art, religion, etc." Today, we are deeply affected when looking again at this precept of Marxism from a materialistic historical perspective. The actual situation in this country at the moment is that our economy is still very much backward. In terms of China's per capita income, we are still one of the countries in the world with the lowest level of income. Although changes in the countryside over these years have been obvious, per capita income is still only somewhat more than 350 yuan, there are still tens of millions of people who have not yet solved the problems of having enough to eat and a warm place to live, and to change this situation two conditions are necessary in a fundamental sense: one is political policies and the other is science. In the past few years, at the same time that the central authorities have been adjusting political policies, they have been repeatedly stressing the development of the function of science and technology, calling upon the mass of scientific and technical workers to find subjects for study at the first line of production, and to throw themselves into the powerful current of technical development, applications, and building the economy. In the process of formulating the "Resolution," comrades of the central leadership once clearly pointed out that in the development of a national economy the force of governmental policies had already been developed, while the force of science and technology had not yet developed. Determination of the principles involved in scientific and technical work has created extremely important conditions for developing the role of science and technology, and the current restructuring of the science and technology system has basically freed scientists and technicians from restraints, has mobilized the armies of the science and technology front to throw themselves into the great cause of promoting the economy. This will have a great stimulus on the development of China's economy.

We ought to notice that even if at the moment China's science and technology is still rather backward, we have after all a force of more than 7 million scientists and technicians. This great force is a developer of new production

forces and has quite an objective potential, technically speaking. Looking at China's current situation, if we are to get our economy going we do not necessarily need a lot of high technology, for the key is in stressing the study of developing production technology, in stressing the quick use of existing technical achievements in production, in changing science and technology into a milk cow that constantly provides a nourishing, rich milk for people. Actually, as soon as many inconspicuous appropriate technologies are used in production there will be obvious economic results. The current reform of the scientific and technical system has mobilized the broad force of scientists and technicians, putting the achievements of science and technology at the first line of agricultural and industrial production, which will have an inestimable significance for the development of town and village economies.

"In Restructuring the Science and Technology System, My Greatest Concern is Talent"

Talent is the basis of any undertaking. Especially today, where science and technology are developing so quickly, scientific and technical talent are displaying increasingly important roles in pioneering work. For us to take up a restructuring of the economic system, and to take up a restructuring of the science and technology system, as well as reform in other areas, is all in the cause of liberating production forces. And within this, to stimulate the enthusiasm and creative spirit of scientific and technical personnel in any way possible to liberate scientific and technical production forces has, then, a particularly important significance. It is just because of this that Comrade Deng Xiaoping emphatically pointed out that "to restructure the economic system, what is most important and what I am most concerned about, is talent. In restructuring the science and technology system, what I am most concerned about is still talent." Comrade Deng Xiaoping also earnestly advised that "a country or a people that does not pay particular attention to knowledge, that does not treasure its talent, certainly has no hope," and "being good at discovering talent, at uniting talent, at utilizing talent, is one of the chief criteria of a leader's maturity." These words of Comrade Deng Xiaoping, as well as reform measures proposed for talent management in the "Resolution" have important significance for improving the awareness of the entire party and for all society regarding the talent problem, as well as creating an excellent environment in which people of talent can come forth in large numbers and where people make the most of their talent. In keeping with abrupt developments in the worldwide new technology revolution, the problem of talented people will more and more become a factor of decisive significance for international social development. Whichever country has the most talent will be the country that can achieve the greater development. Fundamentally speaking, the superiority of a social system ought also to be manifest in the development of talent. The greatest difficulties for China in implementing its four modernizations have not been in the aspect of natural resources, nor in the area of financing, but rather in the aspect of fostering and using talented people. For more than 30 years, because of the influence of the "leftist" guiding ideology, this problem has grown to form a rigid human affairs management system, where the work of cultivating talent has been neglected in China for a long time, and where the function of existing scientific and technical talent has not yet been fully developed. As proposed in the "Resolution," to promote a great number of those young and middle-aged

scientists and technicians who have deep specialized attainments, or who have organizational and management skills and an exploitative spirit to academic and technical key positions and leadership positions will change the situation of idle wasteful talent, will promote the reasonable transfer of personnel, will improve the working and living conditions for scientific and technical personnel, will ensure academic freedom of inquiry and freedom of discussion, and will allow people to seek the truth without any fear, etc., all of which is to fully develop the roles of existing talent and to solve the talent deficiency problem.

Restructuring the economic system and restructuring the science and technology system is just now becoming a worldwide trend. Western countries are changing, and the Soviet Union and East European countries are also changing. Even though conditions in all countries are not the same and the problems with which each is faced are not the same, on this point of the integration of science with economics, that is common to all. It is just from that point that the reform of the science and technology system now being carried out in China is in keeping with historical trends. However, this planned, guided, full scale and deep restructuring of the science and technology system that is like that in China, where the entire party is stressing it, is not often seen in the world. This was a great, strategic policy decision adopted by a country building toward modernization. At present, the reform of the scientific and technical system is developing healthily. The thorough implementation of this great strategic policy is certain to have a tremendous effect on the invigoration of our people and the prosperity of our country.

12586
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LEGAL GUARANTEES FOR SCIENTIFIC WORK DISCUSSED

Beijing RENMIN RIBAO in Chinese 3 Oct 85 p 5

[Article by Hu Keshi [7579 0460 1395]: "Using Legal Means to Lead and Manage Scientific and Technical Work"]

[Text] Should legal guarantees be provided for developing science and technology, should legal means be put into effect to lead and manage scientific and technical work? For a long time, we have lacked understanding of an attention to these questions. In the past, our scientific and technical industries have suffered many setbacks, research work has been unstable, research workers have been pounded; the reasons are certainly many, but the lack of a socialist legal system is undeniably an important reason. In the past few years, although in the scientific-technical field a patent law has been promulgated, and regulations on rewards for inventions and regulations for compensated transfer of rights to technology announced, etc., there nonetheless are still just these points of law; the laws and regulations are still far from able to adapt to the development requirements of our country's scientific and technical industries. The situation at present is that the number of regulations regarding science and technology is small, and some basic problems of scientific and technical work still lack legal regulations; some of the laws and regulations determined in the past have already become partially or entirely void. According to the results of a State Science and Technology Commission survey, almost half of the laws and regulations determined since the 3rd Plenary Session of the 11th CPC Central Committee require abolition or major amendments. Some of the laws and regulations wer determined in the past were mostly used to adjust the internal relations in scientific and technical work; temporary regulations were most common, lacking legal effect on outside units. Looking at this from the laws promulgated by our country in the last few years, concrete articles about relying on science and technology to aid the development of departments have not been written in sufficient number; in both economic law and administrative law there is this insufficiency. The important function of scientific and technical work in the four modernizations still does not have good legal means in operation to make it fully achieve its effect and to give it proper legal guarantees.

Up to today, scientific and technical development has already become an enormous part of society, profoundly influencing every realm of society's

production and life, and its function in the building up of material and spiritual culture is bigger and bigger. The development of science and technology themselves also cannot be divorced from certain social conditions, and must be restricted by various social relations. No matter if it is various kinds of relations in the internal scientific and technical realm, or the mutual relations between science and technology and economic construction, culture and education, labor and personnel, external relations or other realms, they are all more and more complex and intimate.

To coordinate and handle these social relations, we must have corresponding laws, regulations, rules, etc., otherwise it will be very difficult to coordinate uniform, high-efficiency management. To develop scientific and technical industries from relying on policy to relying on both policy and laws is a big change in the scientific and technical management system and methods; we must diligently realize this change, learning and applying legal means to organize, lead, and manage our country's scientific and technical work.

To build up our country into a strong, modern, socialist country, since the 3d Plenary Session of the 11th CPC Central Committee, the party Central Committee has established the strategic position of science and technology, has brought up the strategic policies that economic construction must rely on science and technology, and science and that technology must face economic construction, and has revised a series of concrete policies. In March of this year, the party Central Committee again made decisions on the reform of the scientific and technical system. All of these things greatly liberate the productive power of science and technology, and promote our country's rapid scientific and technical development. How can we guarantee that these policies will be carried out and realized? The important matter is to strengthen scientific and technical legislation, to systematize and standardize the party's policies and mature experiences of implementation and to determine corresponding laws and regulations, so they become standards honored by all.

At present we are carrying out reform of the scientific and technical system, and are carrying it out in rather vast realms to a rather profound degree. Changing the method of appropriations, opening up technology markets, expanding the autonomy of scientific research organizations, increasing the technology-developing power of enterprises, and cooperative development by research and design organizations with higher-level schools and enterprises are all things that need to be recognized by legislation. In reform many new conditions and new problems have appeared that vigorously make clear to us that to simply rely on administrative management methods already won't work; we must put into operation more economic and legal means. For example if technology is to become products, we must resolve the questions of the value of intellectual labor and of intellectual property rights. As for how the ownership of technological achievements, rights to their use and rights to transfer their use should be regulated, and how to delineate the rights of the country, collectives and individuals, because at present there are still no clear legal regulations, some persons selfishly sell the research achievements of collectives, thereby seeking gain, and when the work units involved bring up appeals, the departments responsible for science and

technology think the achievements have already spread to other units and worry that they are exceeding the bounds of their authority and can do nothing; the departments responsible for industry and commerce think no one has signed a contract, so it's hard to arbitrate; some courts, although they would like to do something, have the difficulty of having no law to rely on. Also as an example, in implementing the technology contract system, because we lack legal guarantees, this year abrogations of contracts, breaches of contracts and unilateral abrogations of contracts have occurred ceaselessly, and cannot get fair disposition. Some scientific research organizations have responded that actually more than half of the technical contracts they sign with enterprises have involved conduct in breach of contract, and the economic harm of this has reached tens of thousands of yuan. As a further example, in implementing the funding system for basic scientific research, because no laws have been determined yet about funding sources, paths for applications, assessment methods and administrative checks, experiments can only be made on a small-scale basis, and the system cannot be commonly implemented. The facts make clear that reform requires legislation; scientific and technological legislation already is related to the ability to smoothly reform the scientific and technical system, and has already encountered the urgent problem of whether or not research achievements can be protected.

Developing science and technology is linked to human talent. And to fulfill the function of human talent (including all intellectual laborers), the decisive link is to improve the management and utilization of those persons and to protect their reasonable rights. This not only involves a problem of raising ideological understanding, but also a problem of providing legal protection. For example, at present the quantity and quality of scientific and technical personnel in our country are both very insufficient, but in some work units and departments there still exists the phenomenon of overstaffing and wasting talented persons; how can we aid reasonable mobility of talent? These scientific and technical personnel possess special skills and knowledge in certain areas, and are ready to engage in certain kinds of research or technical work; shouldn't we give them support? Will the inventions and creative achievements and the academic views and technical proposals of scientific and technical personnel be able to receive protection? Some scientific and technical personnel have made outstanding achievements; how can they be given honor and rewards? And so forth; these are all important questions directly related to scientific and technical personnel's rights, initiative, and fulfillment of creativity. We must create a good environment that makes top-notch talented persons able to show their talent, one in which some talented persons can exhaust their talents and have their talents exhaust their usefulness, but this kind of good environment certainly must have protection from the system and its laws. Now many countries in the world have systems of national academicians and awarding national honors. Our country is a great country, which certainly has a number of specialists and scholars with outstanding contributions; they have accomplished things for the development of scientific and technical industries and for the fatherland's socialist construction, so they should receive the honor of the people, and obtain the country's commendation. How to guarantee by the system that the scientific and technical realm produces achievements and talented persons is an important duty in setting up our legal system.

Scientific and technical legislation is a new item of work, and the questions requiring investigation are many. Science and technology possesses broad permeability and is unable to stand independently outside each realm of society, which determines that the various forms of scientific and technical legislation must not only determine a few basic laws for scientific and technical work, but also include all kinds of individual laws to promote scientific and technical development, and should also in other laws and regulations decide items and articles related to science and technology and embody and protect the function of science and technology for society. For example, when determining laws related to factories and enterprises, there should be articles that protect technological progress, and articles about the introduction, digestion and innovation of new technology, etc. Scientific and technical work is also a kind of work that is strongly exploratory and fast-changing. These special points require that scientific and technical workers have necessary independence and autonomy, so that research topics and academic viewpoints and methods have a degree of freedom of selection, requiring that scientific and technical legislation provide protection to creative work and academic freedom. The achievements of scientific and technical labor are ordinarily intellectual, and intellectual products and material products possess differing attributes. We are opening the technology market and aiding technology's transformation into products, but the exchange and pricing of technological products are unstable; in terms of technological transfer there are many distinct rights and obligations involved. While we are determining the laws and regulations about technological contracts, we should consider these special attributes of technological products. To sum up, as we determine laws and regulations regarding science and technology, we certainly must embody the special characteristics of scientific and technical work and reflect the requirements of the economy and society on science and technology.

Strengthening the legislative work regarding science and technology is a large item in completing the socialist legal system of our country. Now our duties in scientific and technical legislation are very grave, and some are rather urgent; we cannot hesitate and not go forward but must take a positive attitude and pay attention to advancing. At the same time the legislation is a difficult, meticulous and complex task, and it cannot be done carelessly; if rights are not balanced, that will influence the stability and authority of the law. There must be a scientific and technical legislation plan, to strengthen the organized leadership of the legislative work. At present the things we must first grasp are urgent and relatively mature laws, and for the others that need revision but haven't been brought to maturation we can first make some temporary regulations, or regulations for single industries or regions, to gather experience from practice, and then form those into laws and regulations. After a few years of diligence, we can gradually complete the perfection of our country's legal system in regard to science and technology, to guarantee our country's scientific and technical work will develop in stability.

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SCIENTIFIC, TECHNICAL SERVICE COMPANIES START UP IN NANJING

Beijing RENMIN RIBAO in Chinese 4 Oct 85 p 3

[Article by staff reporter Wang Yougong [3769 0645 1872]: "A New Contingent of Scientific and Technical Troops--Survey on Science and Technology Service Companies Run by the People in Nanjing"]

[Text] Under the promotion of reform of the city's economy and scientific and technical system, a batch of technological development consulting service companies has sprung up in Nanjing like flowers after a spring rain. Since June of 1984, a total of more than 210 scientific and technical development consulting service companies run by the people have been established in the city, and there are more than 4,600 persons engaged in scientific and technical service on a full- or part-time basis. This new business has, under the care and support of the city CPC committee and city government, enjoyed rapid development. These people-run scientific and technical service companies haven't been established long, but they have already manifested their enormous vitality, which has been expressed mainly in the following aspects:

First, they have aided the transfer and circulation of technological achievements and enlivened the technology market. In the past, because of the restrictions of the departmental ownership system and locality ownership system, the channels for transferring technology to production departments were not smooth, the links for turnover were too numerous, and there was a lack of information exchange and feedback. These people-run scientific and technical service companies are based in Nanjing but have broadly dug circulation channels that face the whole province and the whole country, so that technology ceaselessly flows from research departments, higher-level schools and large enterprises to medium and small enterprises, farm villages and the interior. According to statistics derived from data on 106 companies, from June 1984 to the end of April 1985, more than 1,680 contracts for scientific and technical consulting services and technological achievement transfers were signed by the companies. These companies pay attention to "information, design, production, and marketing," a line of services in their technological services, effectively promoting many kinds of technology. The results demonstrate that this kind of service is especially suited to the requirements of medium and small enterprises and rural enterprises. For example, since Nanjing Scientific and Technical Development Service Company

was founded, through pulling strings and building bridges it helped medium and small enterprises sign more than 540 technical cooperation contracts, with the monetary amount of the contracts reaching more than 6.9 million yuan, solving technical problems for more than 400 work units.

Second, they have provided a new path for circulation of ability and knowledge. Not a few scientific research units, schools and universities, and large factories in Nanjing have quite a few scientific and technical personnel whose knowledge cannot completely fulfill its usefulness. But a large number of medium and small enterprises, especially rural enterprises have rather weak technical ability. The people-run scientific and technical service companies have broken through the dividing lines between work units and departments and have horizontally organized many professional scientific and technical personnel to use after-hours time to develop technical assistance, which effectively overcomes the malpractice of the work unit and department ownership systems, making a large number of scientific and technical personnel who haven't been well used in their original units have a new path, and making some persons with second or third skills have a "place to use their weapons," and even retired scientific and technical personnel have an opportunity to continue fulfilling their functions. To sum up, the people-run scientific and technical service companies implement a method of not moving the persons, but circulating their knowledge, to realize the potential of hidden knowledge, and to achieve a better resolution of the contradiction that "factories can't find capable persons, but capable persons can't find outlets for their talents."

Third, the activities of the people-run scientific and technical service companies helped a few large enterprises and research organizations with solid scientific and technical strength to open up more to the outside. For example Nanjing has a company with more than 200 famous scientific and technical personnel, whose ability cannot be fully used there, but the factory has not been fervent in meeting the requests for help from rural enterprises. After the people-run scientific and technical service companies sprang up in Nanjing, about half of the scientific and technical personnel in this factory participated in those activities, and the leaders of that factory thought that letting the scientific and technical personnel separately participate in the activities of the people-run scientific and technical service companies was not as good as that factory organizing an outside technical service department, to make full use of this portion of know-how. Now Nanjing has not a few large factories that give leave to scientific and technical personnel to run economically independent scientific and technical service companies. These companies use the factories' technical ability as a reserve force, transfer mature technological achievements to the outside, solve the technical problems of many medium and small enterprises and effectively promote the technological progress of medium and small enterprises and rural enterprises.

These people-run scientific and technical service companies have accumulated certain experiences after more than a year of practice:

1. Real technical ability is the source of these companies' existence. The major business of the people-run scientific and technical service companies

is exporting knowledge and technology, therefore real technical ability is the important condition on whether this category of business will be able to survive or not. The survey makes clear that the companies with the better expansion of business are those that rely on large scale national enterprises or scientific research units with solid technical ability. This category of company can provide research, design and production services and receives a broad and profound welcome from medium and small enterprises and rural enterprises. Among the 106 companies surveyed, this category of company made up about one-third, but their business volume made up 45 percent of the total. On the other hand, some companies just depend on a few part-time scientific and technical personnel to take on their duties, and their level of service is usually deficient, sometimes even influencing their regular work.

2. Internal solidarity and sagacious leadership are basic conditions for running scientific and technical service companies well. In Nanjing, all the scientific and technical service companies that are run well have a sagacious, capable, leadership echelon who don't seek private gain, possessing sure organizational ability and specialized knowledge. For example Jinling Electronic Machinery Development Company has few personnel, but their relations are harmonious and their leaders know the business, their management thinking is correct, their reputation is good and they emphasize results, so in the 6 months since its founding the company's gross income was more than 160,000 yuan, and the benefit to society over a million yuan.

3. Maintaining pay according to work is a powerful lever for people-run scientific and technical service companies carrying out intellectual development. Scientific and technical personnel can work part-time after hours in people-run scientific and technical service companies and obtain reasonable earnings, which possess a sure attraction to them. As long as the relations between the state, collectives, and individuals are correctly handled, their initiative and creativity can be greatly stirred up. (Nanjing Broadcasting and Television Technology Development Company) clearly regulated the labor earnings of scientific and technical personnel continuing a project, and the company, when helping a company in Lianyungang raise the output power of a shipborne radio, with seven persons solved in just one month a problem many work units were unwilling to take on.

4. Understanding market requirements on time and providing technological products that fit sales demands are the secrets of the success of the people-run scientific and technical service companies' development. The experience of all the scientific and technical service companies in Nanjing after more than a year proves that only if they actively provide information for medium and small enterprises and rural enterprises, open up consultation, develop products that fit sales demand and "quick and easy" projects, can their "business" become more and more lively, and greater and greater in volume. Otherwise it is hard to avoid "business" slumps or even closing the door in failure.

5. Broadly digging channels of circulation for various technologies and aiding the better combination of technology and production is the road to prosperous development for the companies. These people-run scientific and

technical service companies are based in Nanjing but broadly dig channels for circulation of all kinds of technology; their links are few, restrictions are few, they develop themselves in the process of closely serving the economy. According to incomplete statistics, in more than a year, at least 100 scientific and technical achievements have been spread from Nanjing to the whole country by these companies. For example the Nanjing Electronic Technology Development Company's clients at present extend to Wuzi, Shenzhen, and other places.

Of course, this newborn business still requires practice, exploration and perfected procedures. At present, this category of companies has the following few problems worthy of attention: there is a minority of companies with an overly broad scope of business, with no specialty; there are a very few companies engaged in pure light-commercial activities, not suited to the aims and direction of people-run scientific and technical service companies; there is a minority of companies that provide technical achievements that are from part-time personnel or personnel borrowed from other organizations, of which achievements not a few belong to the unit where the person works full-time, and this kind of invading the technological rights of the original unit awaits a better solution; companies with backing from other units must certainly pay attention to maintaining independent accounts, and should not use the original unit's personnel, funds or equipment without compensation. To deal with these problems, Nanjing, in a spirit of reform, maintained a policy of "support, guide, and manage," and successively formulated "regulations on people-run scientific and technical organizations," "regulations on fitness for inspection for people-run scientific and technical organizations," "regulations on the financial system and technical service," etc. to aid the healthy development of this newborn business.

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AWARDS GIVEN FOR MAJOR SCIENTIFIC ACHIEVEMENTS

HK101521 Beijing ZHONGGUO XINWEN SHE in Chinese 1335 GMT 7 Oct 85

[Report: "China's 'Changzheng III' Carrier Rocket and Other Scientific and Technological Achievements Win State Awards for Scientific and Technological Advancements"--ZHONGGUO XINWEN SHE headline]

[Text] Beijing, 7 Oct (ZHONGGUO XINWEN SHE)--The national committee for examining awards for scientific and technological advancements issued a communique today that 1,772 scientific and technological research achievements, including the "Changzheng III" carrier rocket, have won national awards for promoting scientific and technological progress.

The projects receiving awards include 23 special class, 134 first class, 537 second class, 1,078 third class ones.

The special-class award winners include the "Changzheng III" carrier rocket, which put a communications satellite into orbit April last year; a system for experimental communications satellites and microwave control; a radio measuring and control system for satellite carriers; new technology used in building the Nanjing Changjiang bridge; the theory and practice of prospecting double petroleum gas belts (areas) in the Bohai Bay basin; the method for discovering new-type gold mines and its prominent results; new technology used in building the Chengdu-Kunming railway under complicated geological conditions; and the survey ships "Yuanwanghao" and "Xiangyanghong No 10," which carried out the task of testing carrier rockets over the Pacific on several occasions.

Some technological achievements which have produced great economic results have also been awarded with special-class prizes. These achievements include a water-injection technique to help the Daqing oil field maintain an annual output of 55 million tons of oil for 15 years; the Gezhouba hydropower station, the country's largest hydropower station which has a 170,000 kilowatt turbogenerating set with an annual generating capacity of 7 billion kilowatt-hours; and new technology for producing butadiene rubber, which has helped produce 480,000 tons of such rubber. This type of rubber is marketed as far as in Europe and America.

The first-class award winners include a 3,000 RPM turbogenerator with inner water-cooled stator and rotor, a computer data processing system used in the third national census, the "757" computer with 10 million operations per second, the study and application of the spaceflight life protection system, and an experimental high flux engineering reactor.

The medical achievements awarded with first and second prizes are as follows: a diagnosis and treatment of cancer, a test for early-stage pregnancy, a study of cancer of the esophagus, a study of tumors, and the study and use of artificial hearts.

The departments and individuals who have made the above contributions will be awarded 5,000 to 200,000 yuan. An awards ceremony will be held in Beijing in January next year.

At a news briefing today, Yang Jun, chairman of the committee for examining awards for scientific and technological advancements, said that the first issuance of such awards will be beneficial to turning scientific and technological achievements into the productive forces and to enabling science and technology to cater to economic construction. In the past, awards were issued to those who made inventions and achieved good results in natural science experiments. The establishment of this awards system was proposed by Premier Zhao Ziyang at the national science awards meeting in 1982. The regulations of the awards system provide: First-class achievement awards must acquire advanced international standard of the late 1970's and the early 1980's; second-class achievement awards must approach advanced international standards of the above period; and third-class achievement awards must acquire the most advanced domestic standards.

/12858
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SCIENCE AWARD QUALIFICATIONS DISCUSSED

Tianjin JISHU SHICHANG BAO [TECHNOLOGY MARKET WEEKLY] in Chinese 8 Oct 85 pp 1-2

[Text] The list of the winning projects for the special prize (as recommended to the State Council) and the 1st, 2d, and 3d prizes for the 1985 National Science and Technology Advancement Award were announced today. This was yet another major event as China's science and technology [S&T] circles implement the strategic principle of the Central Committee to the effect that economic construction must rely upon science and technology and that science and technology must be geared to economic construction, and as they implement the resolution by the Central Committee regarding restructuring of the science and technology system. Reporters for this paper thus approached committee member and chairman of the National Science and Technology Advancement Award Examination and Judging Committee, Yang Jun, with relevant questions, and the conversation went as follows:

Question: Please discuss the goals and significance of this newly established National Science and Technology Advancement Award.

Answer: Central Committee leading comrades have proposed that among the broad mass of scientific and technical workers, as well as among workers, peasants, and management personnel, there are many comrades who, although they have made no inventions nor discoveries, have undertaken creative labor in their work of exploiting new technology, new techniques, and new products, and in broadening applications of existing scientific and technical achievements. They have made great, and even outstanding contributions in stimulating technical advances and in improving economic results. To reward these groups and individuals who have made great contributions to aspects of economic construction and the building of national defense, and to even better develop the enthusiasm of the broad mass of scientific and technical workers, with the approval of the State Council we have set up specially the National Science and Technology Advancement Award and issued the "Regulations for the National Science and Technology Award."

The goal for establishing this award is simply to better motivate the enthusiasm of the great number of scientific and technical personnel, and to guide as well as to urge that their work be geared to economic construction, and to encourage the transformation of new technical achievements into

practical production forces as quickly as possible to invigorate the economy and make great efforts.

Question: What is the scope of the National Science and Technology Advancement Award?

Answer: The range of this award was limited only to the field of natural science and technology. The subject matter was quite broad, and may be contained within four areas: developing and applying new scientific and technical achievements; making available and disseminating existing new scientific and technical achievements; using new technology for the construction of large projects, for the manufacture of large equipment, and for the technical renovation of enterprises; and great achievements in the management of science and technology, as well as in standards, measurement, and scientific and technical data. As long as something has been first done in this country, is in the lead within a profession, is technically difficult, the product can be produced in quantity and broadly applied, or that it has already been responsible for outstanding economic or social results, anyone could apply for the award.

Question: What is the procedure for applying for the National Science and Technology Advancement Award?

Answer: First of all, the primary unit of fulfillment or person of primary responsibility applying for an award project makes a report, and those projects that are initially approved by the provincial and department evaluation committees are reported to judging groups for the relevant profession as affiliated with the judging commission for the National Science and Technology Advancement Award, said groups being responsible for judging.

Submission of projects for the first class prize are recommended by the profession judging groups, which request that the judging committee decide. Projects submitted for the second and third class prizes are decided by the profession judging groups, subject to approval by the judging committee; but projects being submitted for the special class prize are recommended by the profession groups, and after a decision by the judging committee, are submitted to the State Council for approval.

Question: What were the chief criteria for judging?

Answer: The criteria for judging has already been made clear in the "Detailed Rules and Regulations for Implementing the Scope of the Awards and Judging Standards for the National Science and Technology Advancement Award. Here, I will add a few things:

1. All projects submitted for the award must have been in use for over a year to demonstrate their functional stability and reliability, as well as proving by passing the acceptance requirements of the utilizing unit that it can constitute the batch production level that is necessary for products, and the projects must have been responsible for great economic or social results, which are the primary conditions for submission.

2. Some projects submitted for the award must be of a particular scientific or technical standard. First class award projects ought to be on an internationally advanced level equivalent to that of the late 1970's or early 1980's; projects for the second class awards must have attained internationally advanced standards of nearly the late 70's or early 80's; third class award projects ought to be of an advanced domestic standard.

3. All projects submitted for the awards must have a very stimulating role for technical advances in the particular field.

Question: What are the characteristics of the winning projects as announced at this time?

Answer: The projects announced at this time as having been awarded the National Science and Technology Advancement Award primarily include large scientific and technical achievements completed since 1978. Special class awards among them include science and technology advanced projects that were special contributions of an especially large nature done since the founding of our country.

In the judging process for this occasion of rewarding projects, we felt that there were three characteristics:

1. A broad scope. There were many award winning projects this time, more than 1,000, which involved many specialized fields, including national defense science and technology, machinery, electronics, chemical engineering, mining, refining, light industries, textiles, agriculture, forestry, medicine, pharmacology, water, electric power, transportation, shipping, construction, environmental protection, and scientific and technical information. A scope of awards this far reaching happens for the first time since the founding of our nation, and is a particular implementation of the principle "Respect science and technology, respect knowledge, and respect human talent" as proposed by the Central Committee since the 3d Plenum of the 11th CPC Central Committee.

2. The results are great. The award winning projects have all obtained significant economic and social results, serving to greatly stimulate technical development. As for example with one of the special class award winners, the Daqing oilfields' water flooding technology exploiting project, which has allowed crude oil production to maintain an advanced level high and steady output over the last 20 some years; the Gezhou Dam and Erjiang and Sanjiang project and construction of the hydroelectric unit, which not only gives a full role to the hydroelectric resources of the Changjiang, but that hydroelectric unit has already provided energy in the millions and millions of kwh to the power grid; or like the development of production in the butadiene rubber industry, where solely through the efforts of Chinese scientists and technicians, not only are products being provided within the country, but they are going as well to international markets. The "electric brush plating technique" that is quite worthwhile disseminating, had already accumulated and created economic results of nearly 500 million yuan by the end of 1984. Or among the first class winning projects, the "chorioepithelioma root treatment and dissemination," which eliminates the pain of illness for our women and

ensures health, and has been a positive thing that has great social results; award winning projects for science and technology have all made great contributions to the modernization of our national defense. In addition to these, among the second and third class winners, they, too, have achieved good economic and social results.

3. A high standard. Award winning projects were of a high standard of technology. As for example, the "Long March No 3" carrier rocket and the experimental communications satellite, as well as the microwave measurement controller system. In building the Chengdu to Kunming railroad, the overall length was 1,100 km, more than 300 km of which is situated in high, treacherous earthquake areas. The risks and engineering difficulties have been seldom seen in the world. Engineers and technicians from the Ministry of Railroads used new technology, new structures, and new designs to allow both the engineering quality and speed of construction to reach contemporary advanced world standards.

Question: After announcement of the winners, how will disputes be handled?

Answer: If there are disputes over the award winners, they may be expressed to relevant areas.

If there is contention regarding those primarily responsible for a project or with the order in which the names are listed, these will be handled solely by the submitting department, and the results of the handling will be reported to the office of the National Science and Technology Advancement Award judging committee.

For disputes involving questions about the substance of the project, when that concerns second and third class awards, the initial examining department will offer concrete suggestions for handling and will report to the profession judging group for a ruling, and the ruling will be reported to the office of the National Science and Technology Advancement Award judging committee for the record; if it is a case of the special or first class awards, complaints will be received by the relevant initial judging department, and for projects that transcend a given department, recommendations will be made by the profession judging group, and for projects transcending professions, coordination will be the responsibility of the judging committee office, which will report to the National Science and Technology Advancement Award committee for a ruling.

If there has been a case of fraud or of plagiarizing of the results of others, the relevant initial examining department will take the lead in investigating. If the evidence is conclusive, it will be reported to the corresponding profession judging group for recommendations on handling, and with the approval of the National Science and Technology Advancement Award judging committee, the award will be revoked, all rewards will be recovered together with any commendations, and there will be criticism and punishment according to the seriousness of the case.

Question: Would you give us your feelings about the judging on this occasion?

Answer: Although there were a great number of things to be judged, time was tight, and there was great responsibility during the judging on this occasion, with the active support of leaders at all levels and relevant personnel, the list of winning projects was finally announced. For this, we express our heartfelt gratitude to the leaders of all units, and to the specialists in the judging groups of all the professions, members of the judging committee, and the whole group of workers and personnel.

First of all, we felt that this great number of achievements were the creative contributions of arduous effort by the broad mass of scientific and technical personnel working at the front lines for a long period of time. For our country to present them with awards for scientific and technical advancement is only right.

Second, in the process of judging these projects, leaders at all levels did a great deal of work, which was without doubt very important for the completion of the project judging. We offer our admiration and regards to them for this high spirit of service to the people.

Third, during this judging, when committee members evaluated a project, they did so carefully and with strict requirements, repeatedly appraising against the judging standards, and during discussions fully expressing their opinions. In addition, the democratic method of casting votes without names was used.

Among the award winning projects, many were of an engineering nature, grand in scale, achievements by the coordination of many disciplines and departments joined in common cause. We hope that we can preserve this glorious tradition in the future, and strive for new achievements, and moreover that among future award winning projects, there will be even more good ones of high quality and great results.

12586
CSO: 4008/2020

PROVINCIAL PROPOSALS REGARDING S&T REFORM

Hefei ANHUI RIBAO in Chinese 10 Oct 85 p 1

[Article by Wang Baijiang [3769 4102 3068] and Liu Zhenhai [0491 3791 3189]: "The Provincial Committee and Provincial Government Offer Their Opinions on Implementing the Central Committee 'Resolution'"]

[Text] To bring the spirit of the "CPC Central Committee Resolution on Restructuring of the Science and Technology System" into practical application, and to resolutely implement the principle that "Economic construction must rely upon science and technology [S&T], and science and technology must be geared to economic construction," the provincial committee and provincial government recently proposed the following ideas for implementation, based upon the actual conditions in our province:

1. Further expand the autonomy of the institutes and begin an institute director responsibility system. Independent institutes must cater to society and become autonomous research exploitation bodies. Under the premise of ensuring the completion of their national duties, institutes would have autonomy in 13 areas, such as having the authority for adjustment of orientation tasking, the authority for arranging the planning of scientific research, authority for utilization of research topic expenditures, and the authority for appointment and dismissal of middle level cadre. The net income of institutes used as funds for science and technology development would not be less than 50 percent, and merit funds would not exceed 30 percent. Institutes would implement institute directory responsibility systems, the director being an upper level committee member or appointed, or he or she could be democratically elected, would report for approval to the higher authorities, and would serve for 4 years. The institutes would practice management by objective.

2. Change the system for allotment of science and technology funds, institute expenditure classification management, and create the conditions for institutes to have economic self-reliance. Beginning with the Seventh 5-Year Plan, science and technology fund allotment from provincial and local finances ought to gradually increase over that of the growth rate for general outlays in financial budgets. Provincially stressed science and technology projects would gradually try out a bidding and contract system. They would institute classification management for expenditures based on the characteristics of

different categories of scientific and technical activities. Beginning this year, for those institutes that chiefly engage in technical exploitation, each department responsible for the work would progressively decrease their operating expenses. Those institutes where conditions are good would end this within 2 or 3 years, while those where conditions are deficient would stop their decreasing within about 5 years. By 1990, and aside from wages and benefit expenditures for departing or retiring personnel, all operating expenses for developmental research units would no longer be allocated. To create the conditions for institutes to become economically independent within 3 to 5 years, institutes would sell the rights to technical achievements, would provide information and data, technical consulting and technical service, and would temporarily not be subject to commodity taxes and business taxes. Capital construction for institutes would be planned yearly with regard to expenditures and materials.

3. Enhance the technical assimilation and exploitative capacity of enterprises, and encourage technical advances for enterprises. Encourage the integration of research, education, and design organizations with production units, and enhance the technical assimilation for enterprises and their capacity for exploiting technology. Factory directors (managers) would pay close attention to technical exploitation. Under leadership of factory directors, systems for technical exploitation would be set up with senior engineers at the head. Large and medium enterprises would establish institutes, and would set up intermediate laboratories and workshops. Medium and small enterprises would be allocated the necessary capacity for technical exploitation. Enterprises must buy the necessary instruments and equipment for developing new products, so within the first 3 years of purchase they may raise the rate of depreciation, 20 percent of that increase to be set by the enterprise itself. When the enterprise uses loans for technical exploitation, the loan may be repaid from the new gains before taxes. The portion of the loan repaid would be regarded as paying taxes to the higher authorities, and would be linked to the total amount of wages for the enterprise, which would float.

4. Open up and invigorate technical markets. It is recommended that each area open up technical trade activities that are multi-level, multi-channel, and multi-mode, that they permit state-run, collective, and individual initiated technical commodity management organizations and service organizations for technical exploitation and technical consulting. Neither units nor individuals need be restricted by regions, departments, nor economic modes in selling technology. For pricing of technical commodities, implement the regulation of the marketplace, and let the buyer and seller decide between them. Intermediary parties may be compensated reasonably, putting off paying taxes for 3 years.

5. Have preferential policies for enterprises to buy the accomplishments of technology and to make use of new technologies. Enterprises should form joint ventures in scientific research and production, using new technology, new techniques, and new materials, they should make joint use of the newly gained profits under 200,000 yuan. By applying to the relevant departments and to the tax departments for examination and approval, they can forego taxes during the first 2 years, paying only half the required taxes on portions over the

stipulated amount; new products developed by enterprises through exchange on the technical market and that are defined within the scope of provincial level products by the provincial science and technology commission and the provincial economic commission, may all supplement developmental planning for new products, and may be sold on a trial basis according to relevant national provisions, free of commodity taxes and ad valorem taxes. When enterprises purchase the fruits of technology and undertake new technical development, their expenditures may be included among production costs. They may apply to banks for technology development loans, may apply to relevant departments for new product trial production fees, and they may use their own funds. Those with special requirements may, with permission, extract from 5 to 10 percent of pre-tax profits for technology development funds.

6. Restructure the science and technology personnel management system, and make full use of scientists and technicians. Institutes should try out an appointment system. The appointing party and the appointee would contract for employment, the appointer being able to extend the appointment from the 2d through 4th years. Staff responsibilities should be determined according to the different positions, and the appointee should be examined according to the conditions of his employment, the examinees ranked according to results, and the tests forming the basis for promotion, adjustment of salary, merit rewards, and whether or not the appointment is continued. Care should be continued for those waiting for employment, and arrangements should be made in accordance with differing situations to help them find work, make it easier to seek employment, and to make full use of them.

7. Go further with the policy regarding intellectuals, and create an excellent environment for people of talent to appear in large numbers and to allow them to make full use of their talent. Leaders from all levels and departments should be concerned about intellectuals politically, ideologically, and in their lives, each year resolving several practical problems. Those outstanding scientists and technicians who meet the requirements of party membership ought to be recruited into the party in a timely manner. Conditions should be created such that the working and living environments for scientists and technicians would be improved, and they should be helped to forget the sorrows of the past. We should make the most of the older generation of scientific and technical specialists and younger and middle aged scientists and technicians in all aspects. Party and government leading comrades at all levels should maintain regular contact with scientists, becoming good friends with them. Science commissions and scientific associations at all levels should become "a family of scientific and technical workers," should serve scientific and technical personnel, and should closely protect the lawful rights of scientists and technicians. Scientific and technical personnel who have made great contributions should be heavily rewarded. We should pay close attention to the training and intellectual renewal of those personnel already working, and do a good job with the education and specialized technical training of the 5 million graduating youth who will go back to their homes. All levels of scientific associations and the learned societies, associations, and research groups connected with them are "links" between the party and government and the broad mass of scientific and technical workers. We want to fully develop the multi-

discipline, multi-level, and interconnecting contact advantages and functions of these organizations.

8. Earnestly enhance the leadership of the restructuring of the science and technology system. Party committees and governments at all levels must place this reform of the science and technology system on their daily agendas, they must regularly analyze conditions, study methods, and formulate plans and implementation programs for particular regions, particular departments, and particular units to realize this restructuring of the science and technology system. Science commissions at all levels must diligently take on the daily work of the reform, must strengthen cooperation among organizations, and even better arouse the "thousand armies and ten thousand horses."

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ACTIVITIES OF NEW PATENT OFFICE DESCRIBED

Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 17 Oct 85 p 1

[Text] Beijing, 15 October (NCNA) Liu Shaoshan [0491 4801 1472], deputy director of the China Council for the Promotion of International Trade, said today at a press conference that since China's patent laws went into effect on 1 April of this year, the Council had already received and processed more than 4,000 patent requests from overseas and Hong Kong.

Liu Shaoshan said that the patent agency of the China Council had received and processed more than 2,000 patent requests. These applications came primarily from Japan, the United States, Federal Germany, England, France, Switzerland, Yugoslavia, Australia, Denmark, Canada, Belgium, Sweden, the Soviet Union, the GDR, and Poland, as well as from Hong Kong. Among them, 44 percent were for machinery patents, 26 percent for electronics, and 13 percent were related to chemistry.

He said that not only had the China Council established an internal patent agency, but also has created together with Hong Kong commercial interests the China Patent Agency (Hong Kong), Ltd. on Hong Kong. This company, too, has already processed more than 2,000 transactions from foreign and Hong Kong area enterprises, organizations, and individuals requesting patent applications in China.

Of the first group of patents for inventions issued last month by the China Patent Office, among those for using new materials and exterior design, 26 were requested by foreigners, 18 of which had been processed by the China Council Patent Agency. This group has already represented Chinese units and individuals with 24 patent requests to England, Japan, and the United States.

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ACADEMY OF SCIENCES TURNS TO PRODUCTION APPLICATIONS

Beijing RENMIN RIBAO [OVERSEAS EDITION] in Chinese 24 Oct 85 p 4

[Article by reporters Kong Xiaoning [1313 2556 1337] and Xia Qiong [1115 8825]: "Chinese Academy of Sciences Enhances Achievement Development and Use"]

[Text] For the Chinese Academy of Sciences, with more than 40,000 scientists and technicians, the scientific and technical achievements of many units in the past would stay for a long time at the stage of samples or exhibits, less than half being extended to applications; that has now been raised to more than 80 percent. This is a result of the Academy implementing in recent years the principle that scientific research must cater to economic construction.

In recent years, the more than 100 institutes affiliated with the Academy of Sciences have universally enhanced their applications research and have established research topics based on the needs of production, so that the period for scientific achievements to become production forces has been shortened, gaining economic results that are hard to even estimate. Based on estimates, the industrial production value made up of the Shanghai Silicate Institute's 1984 scientific and technical achievements as disseminated and used in society was more than 124 million yuan, from which the state received as tax revenue more than 44 million yuan. The Dalian Chemistry and Physics Institute has joined with the Shanghai Wujing Chemical Plant recently to develop a nitrogen hydrogen separator for synthetic ammonia plants to recover and use hydrogen gas. After this achievement is spread throughout the country, it can generate a value of more than 200 million yuan annually.

In strengthening cross contacts with the Ministry of Economics, each unit of the Academy of Sciences has, according to its needs, made use of various effective means, such as accepting development projects on commission, royalties for patents, cooperative development, joint investment and management, and importing technology. Fourteen Shanghai institutes established a cooperative relation with more than 600 enterprises, from which in recent years they have contracted with enterprises for more than 450 contracts involving compensation for technology. The science and technology trade fair held in May of this year by the Changchun Applied Chemistry Institute exhibited more than 300 scientific achievements from recent years. More than 2,000 enterprise representatives from 16 provinces, municipalities, and autonomous regions made more than 60 deals at the fair, and the volume of

the business was more than 1 million yuan. Some scientific achievements that had been obscured for more than 30 years came into use through this trade fair.

A kind of high level technical cooperation relation, where an area selects a project to focus on for the Academy of Sciences to make breakthroughs and where that area also provides some of the research money, has also been set up by the institutes of the Academy with certain provinces and municipalities. At the end of May this year, some interests in Zhejiang Province proposed more than 100 technical projects, requesting that the Academy of Sciences help them. The Academy immediately sent personnel to the areas for investigation, and by now the Academy and the province have reached agreements of intent on 47 projects, and research has begun on 30, some of which have already produced results.

It was revealed by people in the Academy that in order to quicken the pace of joining research with production, the Chinese Academy of Sciences is currently working toward establishing a science and technology cooperative network to make easier the exchange of information among the 12 academies throughout the country and their institutes, and to develop in coordination.

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CSO: 4008/2020

SHANGHAI TO PROMOTE COMPUTERS AT EXHIBITION

OW282032 Beijing XINHUA in English 1556 GMT 28 Oct 85

[Text] Shanghai, 28 Oct (XINHUA) -- Shanghai is sponsoring an exhibition to promote the use of computers, opening 1 December, according to the Municipal Science and Technology Committee here today.

According to the committee, 60 percent of the existing 6,000 computers or microprocessors are idle or are being used for single purposes.

The committee attributed this mainly to a shortage of senior computer specialists.

A committee official said that there are about 10,000 computer specialists in the city, which is still a far cry from meeting the demand.

To make up the shortage, the municipal government is instituting a program to train the city's 370,000 technical and engineering personnel in computer science, the official said.

The official criticized some units where computers were displayed only as "decorations of modernization."

The local government regards the development and application of computers, microprocessors in particular, as a key in the retooling of conventional industry.

A recent survey of 127 large and medium-sized enterprises showed that 87 percent of them had computers installed.

Microprocessors have helped the Shanghai Steel Plant No 10 raise the quality rate of steel plates by 33 percent and the Shanghai Cotton Mill No 12 improved its textile quality by 2 percent.

The committee official said that the city planned to computerize economic information management in commerce, posts and telecommunications, transport, railways, electrical power transmission and meterology before 1990.

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CSO: 4010/1026

SSTC TO STRENGTHEN CONTROL OF TECHNOLOGY MARKET

OW051055 Beijing XINHUA Domestic Service in Chinese 1433 GMT 4 Dec 85

[Excerpts] Beijing, 4 Dec (XINHUA)--A responsible person of the State Scientific and Technological Commission [SSTC] told this reporter today that to promote a further healthy development of the technology market, the SSTC recently decided to strengthen the control over such markets.

The responsible person said: However, some problems that merit attention have emerged from the development of the technology market. Some individual units and persons presented some immature and unreliable technologies for transfer, or plagiarized other people's achievements for transfer. Some illegal individual elements even used fake technologies to carry out fraudulent activities. Such problems have impaired the interests of the society and the people, damaged the reputation of the technology market, and interfered with the normal development of the technology market. Because of such problems, the SSTC decided to adopt some control measures, including:

--It is mandatory that technologies for transfer in the technology market be mature technologies, or achievements or certain phases of technological projects. No exaggerations and forgeries are permitted, nor is plagiarism of another's achievements or infringements upon the economic interests of another's technology. It is especially impermissible to transfer technologies which violate state laws, policies, and stipulations.

--In a technological achievements deal, it is mandatory that both sides sign and abide by the technological contracts according to stipulations on the basis of mutual agreement. Besides stipulating the contents of the technologies, the contract must explicitly state the progress of work; budget; responsibilities and rights of the buyer, the seller, and their agent; prices, remunerations, and their payment methods; responsibility for hazards and the violation of the contract; and so forth.

--Recently, income from the transfer of technology has been exempted from taxation without exception, and part of the income may be used as awards for personnel directly engaged in the development work without being counted into the total cash awards of the units concerned. New products can enjoy the preferential treatment of tax reduction or exemption.

--Scientific and technological personnel may engage in spare-time technological work and advisory services to a proper extent, with incomes credited to themselves, provided that they have completed their work in their posts and that their engagements do not infringe upon the rights of their units. Use of their units' technological achievements, internal technological data, and equipment should be approved beforehand by their units, and part of the income should be turned over to their units.

The responsible person of the SSTC also disclosed that, to ensure the healthy development of the reform of the scientific and technological structures, the state is stepping up the formulation of policies and laws concerning the control of the technological market.

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CSO: 4008/2050

LIAONING TECHNOLOGICAL TRANSFORMATION ACHIEVEMENTS REPORTED

SK230548 Shenyang LIAONING RIBAO in Chinese 5 Dec 85 p 1

[Text] Listed by the state as one of the key areas undergoing technical transformations, the provincial CPC Committee and the provincial People's Government have vigorously conducted technical transformations among old enterprises step-by-step and in a planned manner during the Sixth 5-Year Plan period. During these 5 years, state enterprises and establishments throughout the province have invested some 12.93 billion yuan in projects involving renewal of equipment and other technical transformation measures, fulfilling the target fixed by the Sixth 5-Year Plan by 125.6 percent. With these investments, more than 17,000 renewal and renovation projects have been completed and put into production, which has added 10 billion yuan to the fixed assets.

Technical transformation of old enterprises has brought about the following marked changes to the province's economy:

First, the key transformation projects of the energy industry have been stepped up and energy consumption curtailed. During the Sixth 5-Year Plan period, our province invested some 2.5 billion yuan in renovation projects in the coal, petroleum, power, and other energy industries, mainly including the renovation of the west Fushun open-cut mine; the Guanshan shaft of the Beipiao Coal Mining Administration Bureau; the Xinqiu and Haizhou mines of the Fuxin Coal Mining Administration Bureau; the Dalong mine of the Tiefa Coal Mining Administration Bureau; power plants in Fushun, Fuxin, Minzhou, and Chaoyang; and oil refineries in Dalian, Fushun, and Jinzhou. Thanks to the great efforts in revamping the energy conservation measures, major industrial trades in the province have substantially lowered their energy consumption. For instance, the six major oil refineries in the province have lowered the oil consumption for processing a ton of crude oil from 75 kg to 30.15 kg, and the province's 41 rolled steel heating boilers have lowered the oil consumption from 123 kg to 68 kg for rolling a ton of steel.

Second, the quality and level or standard of products have been improved. During the Sixth 5-Year Plan period, adhering to the principle of combining the popularization and application of the new domestic scientific research findings with the import of advanced foreign technologies, our province

has applied 780 scientific research findings, imported 2,063 advanced foreign technologies, and developed and produced 12,700 new products. Of these new products, 8,963 have been put into mass production, with 331 approaching or reaching the advanced international level. Meanwhile, 281 products have won state gold and silver medals, ranking second in the country, 572 products have won medals issued by ministries, and 1,142 products have won provincial medals.

Third, marked improvements have been made in technical assembling skills of enterprises. From 1981 to 1985, the 10 major industrial departments, including the machinery, metallurgical industrial, chemical industrial, electronics industrial, and light industrial departments, have invested some 7.5 billion yuan in renovating more than 1,000 enterprises. Thus 31 percent of these enterprises reached the international level of the 1970's, in terms of technical assembly.

Fourth, old enterprises have been revitalized, and have made new contributions. During the Sixth 5-Year Plan period, a number of old enterprises in the province have carried out renovation in succession. Through renovation, the Anshan Iron and Steel Company has put 106 technical transformation projects into production, adding the capacity of producing 1 million tons of iron ore and 600,000 tons of low-alloy steel, and raising the proportion of quality products to 50 percent. The Shenyang (Bzötr) Pump Plant has imported many world-standard water pumps from the Tfrg, Japan, and other developed industrial countries, and 25 new-style efficient and energy conserving water pumps have reached the international level of the 1970's or the early 1980's.

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CSO: 4008/2050

BENEFITS OF COMBINING SCIENTIFIC RESEARCH WITH PRODUCTION LISTED

OW170948 Beijing XINHUA Domestic Service in Chinese 0804 GMT 15 Dec 85

[Text] Dalian, 15 Dec (XINHUA)--Commentary: "The Combination of Scientific Research with Production and the Vigorous Development of the Economy and Technology" by XINHUA reporters Zhou Peirong and Li Xinyan

The combination of scientific research with production has added to the vigorous development of China's science and technology as well as its economy. Reports made at the National Experience-Exchange Meeting on Combining Scientific Research with Production currently being held in Dalian indicate the fact that the combination of scientific research with production in various forms, which is a newborn thing, is an important way to produce good economic results, high speed, favorable conditions, high standards, and competent workers.

Such a combination has provided a feasible way to improve the capability of large and medium enterprises to develop and assimilate new technology. At present, in large and medium enterprises the depreciation of fixed assets is close to 50 percent, the equipment is badly obsolete, and the product makeup is relatively simple. If these enterprises embark on the road of integration by enlisting the help of scientific and technological work force specializing in the related fields but not belonging to them, they will be able to boost rather quickly their capability to assimilate and develop new technology. Jinchuan Nonferrous Metal Corporation in Jinchang City, Gansu Province, since 1978 has cooperated with more than 40 scientific research and design units as well as universities and colleges to solve key technological problems. The units have carried out 267 research projects, and the research results of 54 projects have been successfully applied to production. One of the achievements is that the previous problem of serious environmental pollution caused by sulfur dioxide from the smelting process has been quickly corrected. In the 8 years of joint efforts to solve key technological problems, the Jinchuan Nonferrous Metal Corporation has been able to increase its nickel production by an average rate of 17.46 percent annually.

For medium and small enterprises as well as village and town enterprises, combining scientific research with production is the principal way for them to achieve technological advances. With assistance from the Anshan City

Science and Technology Commission, the Anshan Ventilation and Dust-Removing Equipment Plant, an enterprise on the brink of bankruptcy due to lack of market for its products, formed an integrated research-design-production establishment with the Anshan Metallurgy and Mining Design Institute and the Labor Research Institute of the Anshan Iron and Steel Company and thus developed a new product--a dust remover with a big bag as a filter. This enabled the plant to operate at a profit instead of a deficit in less than 1 year. Apart from repaying all its debts, the plant has earned some 200,000 yuan in profits.

Village and town enterprises are short of advanced technology, competent personnel, and information facilities. They are rather incapable of developing new products. Many of their products are of poor quality, and the manufacturing processes for these products have the problems of high energy consumption and serious environmental pollution. A large number of facts over the past few years have shown that transfers of numerous feasible technologies from scientific research and design units to these enterprises have not only saved and revived them, enabled them to make new products to replace the old, and doubled their output value and profit, but also made it possible to create a number of brand-name products for the international market.

With the combination of scientific research with production, scientific research and education units no longer ignore the actual needs of production when choosing the subject for their research work. In addition, they can have the necessary conditions for conducting pilot-plant and industrial-scale experiments in test-applying their research results to production. This makes it possible to translate the research results rather quickly into real productive forces. At the same time, the combination of scientific research with production can enhance the S&T problems but also work out the whole sets of technology that the production units require in order to apply their research results. The technological service receipts in connection with such a combination will increase the scientific research and education units' capabilities to equip and develop themselves, thus changing the state of affairs where they have to depend on the state for their needs. As proved by the practice of the units introducing their experience to the meeting, including the Chinese Academy of Sciences, Dalian Aggregate Machine Tools Research Institute, Qinghua University, and the Jiaotong University of Shanghai, combination of research with production is a significant way to surmount the shortcomings of the science-technology and education systems and to promote the development of science-technology and education work. It is also an important organizational measure to gear the work of science and technology with economic construction.

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CSO: 4008/2050

OVERSEAS INVESTMENT IN OFFSHORE OIL DESCRIBED

HK270909 Beijing CHINA DAILY in English 27 Dec 85 p 1

[Article by Xu Yuanchao]

[Text] More than $1.7 billion has been invested in oil and gas exploration on China's vast continental shelf since 1979.

Funds have come directly from foreign oil companies as well as bank loans from international financial organizations, said Qin Wencai, president of the China National Offshore Oil Corporation (CNOOC).

He told a press conference yesterday that Chinese sub-contractors had received $800 million for services to foreign oil companies operating in the offshore areas.

As of November, Qin said, 110 exploratory wells had been struck, 41 of which had hit oil and gas. Six of those wells are set to produce more than 1,000 tons of crude a day.

The drilling of 60 production wells in the Chengbei oil field of the Bohai Sea has been completed and commercial production started this year. A major oil field is also being developed in the Beibu Gulf of the South China Sea by Total Chine of France. Named Wei 10-3, the oil field was expected to go into operation late next year, Qin said.

The Yacheng 13-1 gas field in the South China Sea, discovered by Atlantic Richfield Corporation (ARCO) of the United States, is also to be commercially developed.

Its 90 billion cubic metres of gas reserves will be sold to coastal cities in South China's Guangdong Province for domestic and industrial fuel and to generate electricity.

Qin said that the BZ 28-1 oil-bearing structure in the Sino-Japanese co-operation zone of the Bohai Sea has to be developed and that feasibility studies for the other six oil-bearing structures were under way. They include the Huizhou 21-1 discovered by ACT group. Xijiang 24-3 found by Philips of the United States, Wenchang 19-1 structure by Esso of the United States, and BZ 34

in the Sino-Japanese co-operation zone of the Bohai Sea, and two major structures discovered independently by the Chinese.

The second round of bidding started in November last year when the oil prices in the international market were declining. But some large oil companies looking at the oil situation from a strateigc point of view have pinned their hopes on China's continental shelf.

He said: "They hope to increase their oil reserves, so do we. Of course we will let them make some profits."

So far there are four contracts signed in the second round of bidding. Qin predicted that six of seven contracts would be signed in the first half of next year.

Some foreign oil companies have given up on China after drilling a few dry wells. "They think it is hopeless to look for large oil fields in China. This isn't logical but can be understood because they didn't find any in their own contract blocks," Qin said.

China has so far signed 28 contracts with 39 oil companies from 12 countries. Some leading oil companies who failed in the first round of bidding now expect to participate in the second round, he said.

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CSO: 4010/2005

PROGRESS IN CONTROLLING ENVIRONMENTAL POLLUTION

OW051308 Beijing XINHUA in English 1258 GMT 5 Jan 85

[Text] Beijing, 5 Jan (XINHUA) -- China has made substantial progress in fighting pollution over the past 5 years, according to the State Environmental Protection Bureau.

Soot removing devices installed in 70 percent of the 100,000 industrial boilers in China help reduce soot by more than 2 million tons and sulphur dioxide by 100,000 tons a year.

The greater number of central heating systems and gas cookers in the cities also reduced the discharge of smoke, soot and toxic gas into the the air.

China was able to treat 22 percent of its industrial waste water in 1984, as against 15 percent in 1981, the bureau said.

The quality of the water of the Yangtze, Yellow, Pearl and Songhua rivers has been improved, and the pollution of some water areas along the coast brought under control.

More than 6 billion cubic meters of waste water, accounting for 20 percent of the total discharge, are used selectively for irrigation each year.

More than a quarter of the industrial residue is being treated and utilized. Some 6 million tons of coal dust are recovered a year, double the 1979 figure. Slag and cinder are used to make cement and other building materials. Ten percent of the urban rubbish and sewage was treated in 1984, as against 2 percent in 1980.

Traffic noise in the principal cities has been reduced by an average of one or two decibles thanks to the restriction of horn blowing and the banning of high-pitched horns.

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CSO: 4010/1026

ENVIRONMENTAL PROTECTION PLAN FOR INDUSTRIAL COMPANIES UNVEILED

HK070829 Beijing CHINA DAILY in English 7 Jan 86 p 1

[By staff reporter Wang Gangyi]

[Excerpt] The State Environment Protection Bureau has unveiled details of a comprehensive plan to tighten its supervision of the country's industrial companies this year.

Qu Geping, the bureau's director told CHINA DAILY yesterday that under the plan, construction, restructuring or expansion of all State-owned and most collectively-owned industrial enterprises will go hand in hand with environment protection.

In future capital construction projects, the director said, the Environment Protection Bureau should play a decisive role in choosing the site, composing reports on environmental impact, judging the projects' quality and checking operational environmental effects.

Qu said that the State had decided that all poor-quality products and production facilities that waste energy and cause severe pollution would be phased out starting during the next 5 years.

The State had also decided that at least 7 per cent of an enterprise's renovation funds would have to be spent on environment protection facilities.

The director said that the country's booming rural enterprises deserved special attention.

A recent survey conducted by the National Center for Preventative Medical Research in more than 120,000 rural enterprises from seven provinces showed that most of them have adopted no antipollution measures. Air pollution in these small factories, workshops and mines has reached alarming levels with high concentrations of toxic substances in the air. As a result, many occupational diseases which were wiped out or drastically reduced in the 1950s have reappeared among the workers.

Qu said his bureau and the Ministry of Agriculture, Animal Husbandry and Fishery would hold a joint conference this year to work out a practical and effective plan to tackle the problem.

Further imposition of pollution fees and more protection regulations and laws were other measures to be adopted by his bureau this year, he said.

It also plans to map out a blueprint for the country's environment protection during the 1986-90 period.

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BEIJING IDEAL SITE FOR 'COMPUTER CAPITAL'

OW141658 Beijing XINHUA in English 1620 GMT 14 Jan 86

[Text] Beijing, 14 Jan (XINHUA) -- Beijing is ideally-placed to become the computer capital of China, but must overcome several problems in order to do so, a municipal science official said today.

A computer administration should be established to build up an effective network for applying the new technology to industry and city management, said Lu Yucheng, director of the municipal Science and Technology Commission.

Lack of co-ordination, bureaucratic blockages between enterprises and a shortage of computer experts had led to a big stockpiling of micro-computers, he said. These problems must be dealt with.

Beijing now has 2,800 such machines stored in warehouses, nearly 10 percent of the country's total, while another 14,000 are being used for less than 3 hours a day.

Lu was addressing a 5-day municipal meeting on the use of electronic science which began today.

He said Beijing had great potential to develop computer science.

About 28,000, or a third of the country's computer experts, worked in the capital. Over the past few years, they had produced more than 7,000 types of technology to be applied in industry and city management.

This technology was being used to modernize production lines, and to manage traffic, hotels, hospitals, banks and house-exchange systems.

The official said that Beijing, an important electronics center in northern China, must tap its potential and promote the wider application of computers.

Computer courses are now being taught at 230 middle and primary schools in the city, and more than 10,000 pupils have so far taken the courses. Most colleges have added computer courses.

An exhibition on computer development also opened today at the military museum in western Beijing. The 1,000 items on display at the show, which ends on January 31, can be bought by visitors.

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CSO: 4010/1026

5-YEAR EFFORT TO BUILD COMPUTER INDUSTRY VIEWED

LD181422 Beijing XINHUA in English 1230 GMT 18 Jan 86

[Text] Beijing, 18 Jan (XINHUA) -- Efforts made in the past 5 years have enabled China to establish its own complete computer industry comprising research, manufacturing and technical services.

The industry now boasts 100,000 employees, including more than 20,000 scientists and technicians. They are working in 250 research institutes, production units and technical service corporations.

Between 1981 and 1985, China produced 1,085 mainframe computers, 65,000 microcomputers and 159,000 items of peripheral equipment. The gross industrial output was valued at 5.1 billion yuan during the period, and a profit of nearly 800 million yuan was earned.

China built its first computer in 1959. But momentum for the development of the industry only appeared in the early 1980's.

Over the past few years, a number of production lines for microcomputers have been imported from abroad and many key enterprises renovated. This has helped to [words indistinct] China's production capacity and technical level. The number of microcomputers produced in 1985 totalled 30,000, a sharp rise of 521 times over 1980.

Computer scientists ahcieved 459 major scientific findings in the 1981-85 period, of which more than 300 have been applied to mass production.

Computer technology advances and a number of products have reached the world standards of the 1980's. They include a super computer able to make 100 million calculations per second and a new photo composition system for Chinese characters. This model uses computer and laser technology functions -- it features automatic alignment and pagination, positioning of margins, underlining sentences and text editing.

Computer quality has also markedly improved. The trouble-free working time of mainframe computers has surpassed 3,000 hours.

At present, 105,000 computers of various types are operating in the transport, telecommunications and petrochemical industries, and in commerce, banking, agriculture, scientific research and education. China-made computers have also been applied to the launching, measuring and controlling of long-distance carrier rockets and China's first experimental communications satellite.

Meanwhile, a nationwide network of technical services is now taking shape. The four national corporations -- the China Computer Technical Service Corporation, the China Computer System Engineering Corporation, the China Computer-Room Facility Engineering Corporation and the China Software Technique Corporation -- have established local branches in many parts of the country, providing maintenance, technical consultancy and training.

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CSO: 4010/1026

ELECTRONICS INDUSTRY TO DEVELOP AT FASTER PACE

HK200816 Beijing CHINA DAILY in English 20 Jan 86 p 2

[By staff reporter Zhao Jinming]

[Text] The electronics industry, a crucial link in the country's modernization drive, will continue to develop at a faster pace than other sectors of the economy during the Seventh 5-Year Plan period.

Total production of the industry is expected to reach 60 billion yuan by 1990, with an annual growth rate averaging more than 16 percent. Li Tieying, Minister of the Electronics Industry [Ministry], said at a national conference on electronics industry in Beijing last weekend.

To achieve this goal, efforts will be concentrated on development of production centres in the cities of Beijing and Shanghai, and the provinces of Jiangsu, Guangdong, Sichuan, Shaanxi and Guizhou. These areas have a solid economic foundation, many technical personnel, a good information network and a potential for exports, the minister said.

In the next 5 years, attention will focus on four main aspects of development: production of integrated circuits, color TV production with domestically-made components, application of computer and communication equipment and expansion of export volume of electronic products, he said.

The industry will also establish five development centres specializing in micro electronics, computer software, communications equipment, industrial electronic equipment and equipment for military purposes, he said.

In order to build a foundation for mass production, 30 large and medium-sized enterprises will be updated in the next 5 years, Li added.

High quality is what counts most in these products. The industry will set up a strict inspection system.

Its goal for 1990 is to being 70 percent of its major electronic goods up to the advanced international level of the late 1970s or early 1980s, he said.

Production of electronic consumer goods will not be ignored, as they will have a larger market during the Seventh 5-Year Plan. Developing electronic consumer goods will help promote component production as well as intensification of the electronics industry, he said.

In the past, the electronics industry has spent more foreign exchange than it earned. To reverse the situation, attention must be focused on expansion of export volume. The industry plans to establish an export production system. It will also place emphasis on export of technology, seeking engineering contracts and providing labour services abroad, he added.

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CSO: 4010/1026

LIAONING STEPS UP TECHNOLOGY TRANSFER

OW160926 Beijing XINHUA in English 0905 GMT 16 Jan 86

[Text] Shenyang, 16 Jan (XINHUA)--Liaoning Province in northeast China has started a project to promote the spread of modern science and technology in its rural areas.

The project aims at spreading advanced technology through a network involving three counties, 20 townships, and 10 villages chosen as experimental bases.

Beginning in early 1985, the program was centered on comprehensive scientific research.

The 3 year program was worked out based on the experience of Fuxing, Kazuo, and Haicheng Counties chosen as experimental bases in 1982.

Over the past 3 years, the three counties have trained more than 226,000 people through 1,100 technology courses.

Some 1,300 experts, technicians, and various other types of professional personnel were invited last year to work in the three counties and 20 townships.

They conducted surveys on local natural resources, helped in working out development plans, and spread technology by training personnel.

Three counties and townships also established ties with over 160 colleges, research units, and industrial enterprises to absorb modern technology.

The 20 townships achieved good economic results owing to the spread of 233 new technology items last year, according to local officials.

By the end of last October, they had produced a total industrial and agricultural output value that was 57.73 percent greater than during the same period of 1984.

In Fuxing and Kazuo Counties, the province's most arid areas with poor natural conditions, per capita income rose from 50 yuan in 1982 to 289 yuan and 250 yuan, respectively, in 1985.

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CSO: 4010/2005

CONSIDERATION OF DEFENSE INSTITUTES DURING RESTRUCTURING

Beijing KEYAN GUANLI [SCIENCE RESEARCH MANAGEMENT] in Chinese No 3, Jul 85 pp 24-27, 46

[Article by Liu Fohua [0491 0154 5478], Institute No 29, Ministry of Electronics Industries: "A Brief Discussion of the Restructuring of Defense Industry Research Institutes"]

[Text] China's defense industry research institutes are an important strength on the military-industrial front, and in the reform of the economic system, to hasten its restructuring would have an important significance for speeding up development of our armament technology, for solidifying our national defense, for shifting military technology to civilian use, and for even better serving the development of our national economy.

I. Changing the Supply System to a Compensated Contract System

For a long time now defense institutes have implemented a supply system. Whether there was any scientific result to be had, either many or few, or whether there would be any technical or economic results, be they high or low, outlay for scientific research and administrative fees (including wages) were all taken care of by the government. Institutes have eaten from the nation's "big pot," staff have eaten from the institute's "big pot," there have been no or nearly no economic means for managing research, and no or nearly no functions for economic leverage. This has created a kind of institute that lacks pressure, motivation, and vigor, and it has inhibited achievements and improvements in talent and technical and economic results. An effective way to overcome this deficiency is to put a compensated contract system into effect.

There are many advantages to implementing a compensated contract system. First, it reduces the dependence of institutes on the state, and consequently it arouses and gives full play to its subjective dynamic role in taking on even more research contract tasking, as well as to completing things as quickly as possible; second, it can encourage institutes to better respect new technologies, new techniques, and the development of new products, to firmly put results into effect, and to attract even more customers to sign contracts by means of the results of advanced technology; fourth, it urges institutes to diligently study modern management theory and methods to improve the standards

of management, to improve working efficiency, to shorten times, to lower costs, and to obtain the highest technical and economic results. In short, it increases the pressure, motivation, and vigor for the institute, which is beneficial for producing results and talent, and improving technical and economic results.

A compensated contract system can be divided into a vertical compensated contract system and a horizontal compensated contract system. All weapons type development tasking assigned by the state is done through a vertical compensated contract system, where the leading organization assigning the task signs a contract with the party taking on the development. The substance of the contracts chiefly includes: (1) points out the goals and significance of the development; (2) requirements for technical indices (including quality and reliability); (3) development progress and completion time; (4) provides the form and quantity of the product; (5) expenditures required by the institute and the modes and dates for payment; (6) the duties and responsibilities assumed by each party to the contract; (7) economic responsibilities that should be assumed upon unilateral suspension of the contract; (8) rewards and punishment. The contract goes into effect with the signatures of leaders of both parties and after stamping with official seals. That all units from allied factories, institutes, institutions, troops, and social organizations get their development tasking directly from the institute is a manifestation of a horizontal compensated contract system. They all sign their own contracts with the institute as customers, the substance of those contracts being essentially the same as with the vertical contracts. But when signing the contracts, it may be requested that the local notary participate for legal efficacy.

The following problems should be clarified when undertaking the compensated contract system:

1. The problem of development outlays. This includes both direct expenditures for the subject of development (as for example the costs for basic devices, raw materials, outside help, special equipment, and testing) and indirect expenditures for the topic (like wages for development personnel and management personnel, depreciation of instruments and equipment, energy and transportation, and management expenditures). The amounts that must be spent on the research topic are related to the factors of the degree of technical proficiency required by the development tasking, the technical difficulty, the quantities to be developed, the amount of manpower and material that must be invested, and the level of management for the institute. It goes without saying that development fees are a crucial point of contention when signing contracts, for both parties to the contract will maintain its own reasoning in asking or paying prices. Toward this problem, budget and payment dates for project direct expenses and indirect expenses can be first proposed based on the research methods and according to the technical index requirements, progress, and quantities of the research project, and according to the initial research plan. Because research tasking is exploratory, the more new technology is required and the greater the difficulty, indeterminable factors in the research are more numerous and the risks that are assumed are greater. Therefore, based on the budget, different unforeseeable expenses should be allowed, and more should be added as the exploratory nature

increases, which could be held to between 5 and 15 percent. After the party that has accepted the project has proposed the expenses that are required, when both parties to the contract are discussing it, both should patiently listen to the ideas of the other party, and actively seek a reasonable plan that both sides can accept, which will finally be provided for in the contract document.

2. The problems of compensation in the contract system. After contracts have been signed, the result that is carried out is closely related to the factors of the degree of subjective effort by the institute, scientific and technical factors, and the level of scientific management. The following consequences might occur: (1) the task might be both finished before its time and also some of the research fee might be saved; (2) the task might be finished before time, but there is no fee surplus; (3) the task might be finished before time, but the fee is insufficient; (4) the project is finished on time, with a fee surplus; (5) the task might be finished on time, but there is no surplus; (6) the task might be finished on time, but the fee is insufficient; (7) completion of the project might be delayed, but still with a fee surplus; (8) the project might be delayed, with no fee surplus; (9) the task might be delayed, but the fee is insufficient. But no matter what happens, it is right that the party having a surplus be compensated, and moreover, that the more of the fee is saved, the more should be the compensation. This is to fully arouse the enthusiasm of the party accepting the research. There are two types of compensation, one of which can be adopted after discussions by the two parties.

The first kind is the project fee responsibility system. For tasks that complete the specifications of the contract in the specified time, the two parties undertake an appraisal and transfer, any surplus fee being kept by the accepting party. When the fee is insufficient, the accepting party must provide its own funds to continue completion of the task.

The second kind is when after completing the contract responsibilities, a suitable proportion of the surplus research fee will be kept by the accepting party, the remainder to be returned to the party that has provided the tasking. If because of factors that truly could not be controlled the fee is found to be insufficient, a report may be made by the accepting party stating the reasons, and after investigation and approval by the providing party, an appropriate amount may be added. Table 1 is a retention reference comparison.

Table 1

K (%)	≤15	15.1-25	25.1-35	35.1-45	45.1-55	55.1-60	65.1-75
B (%)	100	99.9-90	89.9-80	79.9-70	69.9-60	59.9-50	49.9-40

K in the table is the percentage of the fee stipulated in the contract that is surplus. Figured according to (1) below, B is the compensated proportion corresponding to that. When $K \leq 15\%$, $B=100\%$, and with every increase in K of 0.1%, B drops 0.1%. The compensated amount G is figured according to equation (2).

$$K = \frac{J}{H} \qquad (1)$$

$$G = J \times B \qquad (2)$$

where J is the surplus development fee; H is the research fee determined by the contract.

Steps for calculation methods for the compensated amount are: first, calculate the value of K according to (1) (the second position after the decimal point is rounded off), determine the compensated proportion B, then calculate according to (2). For example, when the research fee has been determined by the contract to be 1 million yuan, and after completion of the contract task there is a surplus of 153,600 yuan, according to the methods above, K = 15.4%, B = 99.6%, and G is 152,886 yuan. Table 2 shows that when H = 100, the compensated amount can be reached by calculating the different surplus fees.

Table 2

1 J (万元)	15	15.1	15.2	…	16	20	25	…	50	55	57	57.2	57.4	57.5	57.6	57.7	57.8	58
K (%)	15	15.1	15.2	…	16	20	25	…	50	55	57	57.2	57.4	57.5	57.6	57.7	57.8	58
B (%)	100	99.9	99.8	…	99	95	90	…	65	60	58	57.8	57.6	57.5	57.4	57.3	57.2	57
1 G (万元)	15	15.0849	15.1696		15.84	19	22.5	…	32.5	33	33.06	33.0616	33.0624	33.0625	33.0624	33.0621	33.0616	33.06

1. 10,000 yuan

The calculations above show that these compensation proportions are similar to normal distribution. As the surplus fee increases, the compensated amount increases with it. This exhibits the principle that the greater the surplus the greater the compensation, which is useful in motivating the enthusiasm of the accepting party to save on the fee. But when K has increased to 57.5 percent, the greatest value for compensation is when B is 57.5 percent, at which time the surplus fee begins to rise again, but G begins to drop. This can discourage a tendency for the minority of units who would intentionally inflate the amount of the research fee that is needed, hoping to obtain an even higher amount of compensation.

3. Rewards and Punishments. To encourage the enthusiasm of the accepting party, when all contract tasks are completed ahead of time and all important technical indices have exceeded the requirements provided in the contract, aside from the method of compensation described above for the surplus fee, there should also be other rewards. For all tasks that are not completed by the time stipulated in the contract, or that cannot attain the technical indices originally stipulated, and in all cases where one party breaks off the contract, there should be punishment. To effectively execute contracts, shorten times, and improve the performance and quality of a research product,

it is only right to have significant rewards and penalties. As for how to reward and punish, this should be provided for by the two parties in the contract document.

II. Changing the Pure Research Form to One of Scientific Management

For a long time now, defense industry research institutes have been of a pure research model. Research fees and administrative activity fees were by a supply system, which is the material base that exists for pure research. The obvious characteristics of the pure research model are that it does not emphasize economic accounting for research topics, it does not take costs into consideration, it does not emphasize research achievements and the dissemination of applications, nor does it respect the improvement of technical and economics results. Practice has shown that the pure research model does not accord with the rules of scientific research development nor of the rules of economic development. There are now many people who have realized this serious deficiency, and who have adopted appropriate steps and measures for operations management. Also, they have explored certain experiences and become aware of their benefits, which show the necessity for this kind of institute to "get on the right track and change its form." Therefore, during the restructuring of the economic system we will change every type of work in this institute onto the track of producing results, turning out talent, and improving technical and economic results, all to "get onto the right track." How will we accomplish this?

1. We will cultivate a correct guiding ideology. We will resolutely implement the 16 character principle of the Central Committee to "Integrate the military and civilian, integrate war and peace; military goods have precedence, but use the civilian to nurture the military" and the directive that "each department in national defense industries, aside from guaranteeing the completion of armament research and production tasking as ordered by the State Council and the Central Committee Military Commission, is to spare no effort in taking up the research and production of civilian goods." That is, with the prerequisite that completion of defense research, testing, and production tasks must be guaranteed, open up the doors, improve technical and economic results, but definitely do not relax defense duties in the simplistic pursuit of economic results. This is the fundamental distinction between restructuring the defense research institutes and the civilian institutes.

2. Actively develop research, attain even more research achievements, emphasize the dissemination of applications, stress the shift of military technology to civilian use, and hasten the transformation to technical and economic achievements. If we are to do these things well, we must resolve two problems. Foremost is the raising of ideological consciousness and to overcome the prejudice against emphasizing achievements and the tendency to disregard dissemination of applications. Attaining research achievements is the important first step, but if they are not disseminated and applied in order to obtain economic and technical results, but rather are locked up behind high walls, no matter how many achievements there are nor how good they are, their significance and practical value will be lost. Also, we want to draw up rules for rewarding the dissemination and application of research achievements, and reward according to their contributions those people who put

a great deal of effort into obtaining results for dissemination and application. When this policy is in effect, efforts at disseminating and applying the achievements of scientific research will present us with a new situation, from which we will obtain even higher technical and economic results.

3. Be geared to the needs of the economy, and society. The characteristics universal among defense institutes are: that there are many middle and higher level scientists and technicians; instruments and equipment are more advanced than those of enterprises, and are more complete; they have abundant research design, formulation, and production capabilities, there is great potential, and they have the complete ability to cater to the economy and cater to society under the premise of completing their defense tasking. We will sign even more compensated contracts with departments in industry, agriculture, forestry, animal husbandry, byproducts, fishing, commerce, education, and the military based on the strengths of the particular professions and of the scientists and technicians. There will be compensated transfer of rights to technology and to scientific research achievements, we will provide technical consulting services and will take on processing of imported materials. We may also jointly operate technical development centers and development companies with relevant units, and with qualified units might develop and produce one or two key products that can achieve economic results; we may invest technically or with knowledge in civilian run enterprises or in shareholding operations, etc. In summary, by catering to the economy and to society, we will make the most of our strengths and avoid our weaknesses, will open vast new financial opportunities, and will strictly forbid any arbitrary projects without an analysis of economic results.

4. We will enhance the survey of research and the collection and analysis of technical and economic information to improve our operational decision making capabilities. We will make resolute decisions in a timely manner. In this situation of opening to the outside, domestically invigorating the economy, and permitting competition, information is crucial, efficiency is life, and time is money.

5. We will enhance operational management, will do well at accounting for project development expenses and other expenses, will adopt strong measures for strict control of development costs and all sorts of management expenses, and will establish technical and economic responsibility systems and various operational management systems to get results from strengthening operations management.

6. We will sign contracts within the institute, and will handle well the internal performance. We will get rid of the egalitarianism whereby the staff eats from the "big pot" of the institute, and will make large differences in the amount of bonuses. There will be substantial rewards for those people who have made outstanding achievements in attaining research achievements and application results, and who have improved economic results, and there will be substantial punishments for those who neglect their duties and cause economic loss, and we might even float wages internally. We definitely cannot treat working and not working as the same, or treat doing well the same as doing poorly. This is complicated, arduous, and painstaking work, and in its

implementation and execution there are bound to be obstructions and difficulties, and we must dare to meet adversity and be good at invigorating research using economic means.

7. We will restructure the leadership and management systems within the institute to meet the needs of restructuring. We will implement the institute director responsibility system, and will separate the government from enterprises. The institute directors will have full responsibility for research production, operations management, and administrative management, including personnel, finances, and property control. He should carefully select assistants to help with his work, as for example when choosing senior engineers good at technical management, an assistant institute director (there could be two) good at planning, production, operations, administration, and research logistics materials management, and a senior accountant good at financial and accounting management, careful calculation and strict budgeting, increasing income and decreasing expenditures, and at improving economic results. At the same time, set up a corresponding management functions department. He should employ capable people who are enthusiastic and suitable, and not lackeys who are incompetent and boasters and sycophants. They should work toward an organization that is streamlined, where personnel are keen witted and capable, and where work is carried out efficiently.

III. Some Problems That Should Be Emphasized and Resolved

1. The problem of establishing a basic research fund system. It is well known that without basic research and without advanced technical reserves, there will be no installations of an advanced standard. Only when basic research is well taken care of, there are new technical reserves, and research into types of weapons systems can there be short turn around and low costs. The exploratory nature of these projects is great, there are many indeterminate factors, and they might even fail; there are many problems using the compensated contract system, great difficulties, and perhaps it will be impossible to go on. To ensure the regular progress of this work, a constant development and improvement of the levels of weapons, it is absolutely necessary to establish a fund for basic scientific research. For many projects in basic defense research necessary investment is great, turn around is long, and at present the institutes have a weak economic capacity, with no ability to support those kinds of expenses, and the problem must be resolved through allocation of state funds; some projects that are not too costly can be paid for out of funds kept back from development funds by the institute. We could study and determine the limits to the amount of funds the state can allocate, the institutes could then first propose projects for developing basic research, expense accounting, and layouts for research time, then carry them out after reporting to higher levels of leadership organizations. When the work is finished, there would be a timely accounting, and if there is a surplus in the allowed expenditures, it could be turned back into use by other basic research projects, and when it was not sufficient it should be made up. Higher level organizations should issue plans of an instructional nature to enhance the work of checking and rewarding or punishing. Research organizations should invest sufficient effort into developing this kind of work. Because basic research will take more arduous mental effort and labor and results will be slow in coming, and there is even the possibility of

failure, there should be encouragement and guarantees in the policies of reward so that personnel involved in basic research will work enthusiastically and contentedly. Paying close attention to basic research and technical reserves is long ranging work that benefits the state and the institute, and we should not make the mistake of "near sightedness" with a mind only on the economic results in front of us, and thus neglect something.

2. The problem of transforming technology. As science and technology and production technology develop, institutes must constantly remold their technology, renewing the instruments and equipment for research design, formulation, and production. As we have said before, the current economic capacity of the institutes is weak, and there is no way to resolve the problem of expenditures for high investment technology transformation projects. We should study and determine a limit, where those above a certain amount of money would be funded by the state, and those less than that would be paid for by development funds retained by the institute.

3. The problem of expanding institute autonomy. At present, restraints are being lifted and authority redistributed, and superstructures that are not suitable to the development of research and production are being adjusted. In the restructuring of the economic system, new problems are certain to be uncovered, and there must constantly be additions and subtractions based on changing circumstances. We must break up all obstacles obstructing the development of research and production and that obstruct the improvement of economic results.

4. The problem of an institute's retention and allocation ratio. After putting the compensated contract system into effect, it is proper that the technical and economic profits earned by the research institutes would not be passed on to higher levels, but there should be an appropriate percentage allocated for use. We should consider both the continued development of the institute and benefits and rewards to the staff. Currently, using the following percentages would be appropriate: 50 percent of the income would be for a fund for research development; from 25 to 30 percent would be a fund for group benefits; and from 20 to 25 percent would be for a fund for rewards. The latter two items could also be used together to increase the range of activities of the institute.

5. Because of specialized technology, it would be difficult for some defense industry institutes to shift toward civilian use, and there would be limits to expanding the range of operations; in some areas, transportation is not convenient and information is difficult to get, management expenses are high, research costs are high, working conditions are difficult, etc. It is necessary that for this kind of institute special provisions and preferential policies should be formulated.

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CRITICISMS OF LOCAL RESEARCH ORGANIZATIONS

Beijing KEYAN GUANLI [SCIENCE RESEARCH MANAGEMENT] in Chinese No 3, Jul 85 pp 33-34

[Article by Chen Xianhua [7115 7359 5478], Science and Technology Commission, Tianjin Municipality: "Looking Into Problems of Local Research Organizations in Setting Up a System That Is Open to the Outside"]

[Excerpt] Based on the requirements of overall tasking of the party in a new historical period, the goals for Tianjin Municipality for the year 2000 are: under the premise of economic results, to realize a quadrupling of the industrial and agricultural gross output value, as well as make an appropriate contribution to the quadrupling of the national industrial and agricultural gross output value, and make efforts to build Tianjin Municipality into a modern socialist industrial and commercial city and an international port city. To implement this strategic goal, we will on the one hand pay close attention to technical advances in traditional industry, because Tianjin Municipality has more than 4,400 enterprises (not including town and township enterprises), so quickening the technical advance of traditional industry is a chief duty for making the economy of Tianjin Municipality prosper; in another sense, we will stress the development of new and rising industries, and will strive to as quick and as great a degree possible raise the proportion of new and rising industries in both the economies of Tianjin Municipality and of the nation. In the face of these tasks, it would be difficult to be successful unless the scientific organizations of Tianjin undertake a restructuring. According to statistics for the scientific and technical achievements of 60 research organizations from 1981 through 1983, 18 were able to increase annual production value by 500,000 to 1 million yuan, which is only 2.3 percent of the total number of achievements over the three years; 14 managed annual increases of 100,000 to 150,000 yuan, which is only 1.79 percent of achievements over the 3 years. Adding the two together is still only 4.1 percent of achievements over the 3 years. Economic results for the majority of scientific and technical achievements were negligible, which both explains the problems research organizations have with the economy, and also the necessity of establishing a system that is open to the outside.

Because in the past China had been effected by the "leftist" isolationist thinking, many research organizations followed an isolationist guiding ideology in developing scientific research. Under the influence of this

ideology they were blind to new foreign technology, always starting everything from scratch, neither willing nor able to use the research results others had already come up with, from which they could have transformed, improved, and developed the research to a higher level. The results of this were: 1. there were not many scientific achievements. Based on a survey of research organizations associated with 60 industries in Tianjin, there were 4,837 scientists and technicians, with an average of 80.06 per institute, 1,021 projects were prepared from 1981 through 1983, which is an average of 17 per year per institute, and 779 projects were actually appraised during the 3 years, which is 76.29 percent of the total number of research projects prepared, an average of 13 per year per institute. The 400 achievements that were put into production or disseminated over the 3 years is 39.17 percent of the total number of projects planned or prepared, for an average of 6.66 projects per institute per year. If we analyze this according to the number of people and the number of research achievements, we find that an average of 6.2 scientists and technicians appraised 1 scientific achievement over the 3 years. If we convert that to the number of people to appraise 1 achievement in a year, it comes to 18.6. 2. The quality of scientific achievements has not been high. Among the 779 research achievements from 1981 through 1983, 397 projects were of an advanced domestic standard, or 50.96 percent, 216 won achievement awards of various sorts (from national ministries down to professional companies), which is 26.44 percent. 3. There has not been broad application for research achievements. Over the 3 years, 401 went into production or were disseminated, which is 51.34 percent of the research achievements actually appraised in the 3 years. If we consider this according to what has gone into production, 264 were put into production or applied in Tianjin Municipality, which is 66 percent, there were 36 put into production or applied in other provincial cities, or 9 percent; 100 were put into production or applied within the particular institute, which is 25 percent. There have not been many research achievements, quality has not been high, and they have not been broadly applied, which explains the need to transform the isolationist research system to an open research system.

To make new products from scientific research, self-reliance is fundamental, but it is also necessary to import advanced technology from abroad. The purpose of importing is to learn from it, absorb it, use it for ourselves, enhance China's capacity for self-reliance, and to innovate on this basis. Tianjin Municipality has imported a great deal of advanced technology and equipment from abroad in recent years, and beginning in 1983, the state provides us with $200 million, which is used to import advanced technology from abroad and for the technical remolding of enterprises, but our local research organizations have still not adapted to the hundreds of items of advanced equipment and technology imported each year: many research topics have stopped at investigating information documents and materials on foreign science and technology and at studying the foreign patent information manuals. They have not taken more steps forward to penetrate the realities of building toward the four modernizations, and they have not put their primary efforts into analyzing the advanced technology and equipment that is already being applied in the building toward the four modernizations. Consequently, they cannot easily develop high level research based upon the strengths of others. Based on an analysis of the 779 research achievements appraised by 60 research organizations in Tianjin Municipality from 1981 through 1983, 53 were near or

had attained internationally equivalent levels for certain projects or certain project indices, which is 6.8 percent; 125 were initially created in this country and filled a domestic need, which is 16.04 percent; another 382 (49.04 percent) could not even reach advanced domestic standards. Among the 216 receiving achievement awards, 33 received awards at or above the level of a national ministry level, which is only 15.27 percent. That local independent research organizations do not put their chief efforts into a steady increase of learning from and absorption of imported advanced technology, but put it into a great number of research projects that are not even advanced in this country, is also the effect of an isolationist scientific research system that should be restructured.

We can see from this that for local research organizations to set up a system that is open to the outside is an important matter for the restructuring of the science and technology system.

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EVALUATION OF CIVILIAN GOODS PRODUCED BY DEFENSE INSTITUTES

Beijing KEYAN GUANLI [SCIENCE RESEARCH MANAGEMENT] in Chinese No 3, Jul 85 pp 43-46

[Article by Xia Guofan [1115 0948 5672], Institute No 608, Ministry of Aeronautics: "A Brief Discussion of the Development of the 'Eight Term Decisions' for Civilian Goods by the National Defense Science and Technology Institutes"]

[Text] Based on the principles of "Guarantee military needs while shifting to civilian production" and "Integrate military and civilian production," the national defense science and technology [S&T] institutes ought to take on the dual functions of building the national defense and building the economy. And while under the premise of guaranteeing scientific research into military goods, should put all its effort into developing the civilian goods urgently needed in the marketplace to serve improvement of production forces, to serve the soaring national economy, and to serve major construction and the technical renovation of existing enterprises.

I.

Talent, knowledge, and technology are concentrated at the national defense S&T research institutes, the means for experimentation, advanced development, and testing are complete there, and there are strong capacities for development in corresponding technical fields. Therefore, the selection of topics for research at the national defense S&T institutes and the types of civilian products ought to have their own characteristics. The first thing to avoid is not caring about what you get, fighting with civilians over "food," and getting involved in an unprofitable low grade products that can be produced by the average factory; the second thing to avoid is fighting with civilians in a "tangled, industrial war," fighting each other for the "inside track," and busily chasing after products that are popular and faddish; the third thing to avoid is pitting strength against strength, equipment against equipment, and getting into labor intensive products. We must truly shift the focus of research development toward the manufacture of production materials that have a degree of difficulty and for which there is a national need. We must shift toward stimulating advances in production technology, and must shift toward the path of promoting economic development.

II.

Since the 3d Plenum of the 11th Party Central Committee, our institute has maintained the path toward integration of the military and civilian. Keeping in mind the entire situation of national construction we are protecting the military while shifting toward the civilian, and based on the strategy of "catering to the economy, selecting correct goals, highlighting points of focus, and paying attention to real results," we are freeing up our thinking, expanding our field of vision, and enthusiastically organizing research into civilian goods. We have taken the responsibility for more than 40 large and medium research tasks on behalf of more than 10 professions and departments like foodstuffs, textiles, petroleum, railroads, electronics, navigation, medicine, culture and education, scientific research, and construction. In the last 3 years, we have had contracts for more than 10 million yuan, and have already successfully developed and turned over for use some 27 projects, 21 of which have made up for national deficiencies. Some of these have reached the levels of advancement of similar foreign products, allowing our institute to rather quickly change from "isolation" to being "open to the outside," from a traditional research organization toward research management and exploitation, and from simple "military type goods" to "goods integrating the military and civilian."

In the experience of this institute in development of civilian goods over the years, we have come to realize that with the principles of similar technology, similar structures, and similar techniques, correct use of the "eight term decisions": "new," "superior," "change," "create," "joint," "transfer," "quick," and "serve," has brought development of civilian goods to a deep and broad opening of advanced and effective channels.

1. Working on the term "new."

To suit the needs of building the national economy and developments in science and technology, we have made the most of the technical advantages of our institute, we have imported and imitated new products, we have designed new products by modification, and have prepared for the development of new products. As for example the 17 new measurement instruments for measuring displacement, temperature, pressure, changes in speed, vibration, and flow, and for controlling the operations and malfunctions of technical equipment, which are for both military and civilian use. The needs of society are great, and relevant departments in the bearing industries, railroads, petroleum, and electronics are demanding one after the other that this technology should be shifted to enterprises connected with the institute.

2. Thinking about the term "superior."

In developing a brand name product of superior quality, there must certainly be an effort throughout the process to make "superior" successful. Scientists and technicians at the institute must strengthen their concept of "quality first, reputation is supreme," and develop according to the needs and requirements of the user safe and reliable, well tested, attractive, easy to repair, and trusted products of superior reputation. As for example where this institute developed a rail metal spring automatic production line

together with the Zhuzhou Bridge Factory. Comparing it to the old style assembly line, production was up 25 percent each shift, the cost of each component dropped 25 percent, electrical consumption dropped 72 percent, labor was reduced 50 percent, there was a saving of 25 percent in surface area, and the quality of the metal springs was stabilized, which solved an earlier quality control problem with surface extrusion marks. A metal spring can be manufactured in 7 seconds, with an annual capacity of 2 million, from which profit can reach 600,000 yuan, recovering the development fee in less than 3 months. Because of the superior quality and excellent results, this factory now wants to develop a second and third automated production line to even further expand their production capacity.

3. Putting effort into the term "change."

When civilian industries undertake technical transformation, they shift production to a basis on the new technology, which is a necessary path toward a prosperous economy and modernization. Therefore, we have put effort into the term "change," duty bound to maintain internal expansion before production. Because of our nation's demand to hasten the development of foodstuff mechanization, after we successfully developed China's first automated bread production line for Zhuzhou, we then took on the task of developing automated bread production lines for the food industries in Shanghai, Beijing, Fuzhou, and Shenzhen. Currently, the "Shanghai line" is at the stage of installing debugging equipment and beginning trial production. This "line" has 53 individual machines and 8 controller cabinets. The entire line is microprocessor controlled and mechanically linked, which has allowed this plant to change from mainly manual operation to automated production, as well as to speed up operations, producing a loaf of bread in 0.85 seconds. Not even adding people, daily output has increased from an original 7 tons to 18 tons, an increase in capacity of nearly 2.6 times. This has caused this plant to complete rather successfully a technical renovation that is based on technical advances, is guided by expanded production capacity, and is centered on economic results.

4. Writing on the term "create."

The national defense science and technology research institutes ought to actively participate with civilian industries in the study of imported technology, they should go the way of "import, learn from, develop, and innovate," and write on the term "create." There is a famous slogan in Japan, "synthesize, then create." From 1950 to 1973 they spent a total of 4.36 billion yuan to import 21,863 foreign technologies from which to learn. Then, by integrating with their own technology, they imported, synthesized, and improved to create an even more advanced technology, which stimulated their economic development. We definitely should not be too conservative, but should follow in the footsteps of others, copying, imitating, and emulating, and should use the principle of "reverse engineering" to do thorough, systematic, and penetrating analyses, studies, and testing of imported products. We should take broadly from the many good things, fuse together and extract, and create new products that are better than imported technologies. As for example with the imported the technology for turbocharger intake regulators, where this institute resolved a difficulty with the engine's

burning of light oil, which opened new ground in the conservation of energy; we installed a fuel saving device of our own design on a new type of imported sample vehicle, which reduced the fuel consumption of the vehicle over 100 km by 14 percent; we changed three different models of imported automatic mat weaving machines from single purpose machines to multi-purpose, and changed the needle plate stop to a photoelectric stop, which allowed new colors and high quality in producing grass mats, a product acceptability rate of 99.6 percent, and implemented "Sinicized foreign equipment." The facts have shown that after advanced foreign technology has been "taken over," there is keen innovation and bold advances, which greatly improve the starting points for the development and technology of civilian goods, and which stimulate bounding developments in science and technology.

5. Some ideas on the term "transfer."

Adopting multi-mode, multi-channel transfers of the rights to technology allows the achievements of science and technology to enter the realm of exchange. Chiefly, this is in selecting those scientific achievements and specialist technologies that are highly technical, effective, and difficult for the producing factory to develop directly. Transferring the rights to technology to civilian industries allows the knowledge of the national defense science and technology institutes to "go into operation," and to achieve "output" within an even greater scope. In addition to direct transfer of rights to scientific achievements and technical export, this institute has also focused on suitably modifying military engines or components and shifting them to various fields in civilian industries, as where we made use of an inert gas generator to create new technologies for mine fires; we made use of natural gas compressing stations to recover light oil and produce liquified gas; we made use of the development of a smoke energy catalytic installation to provide the petroleum and steel industries with recovery of heat and pressure for use in the working generation of electricity.

6. Opening new ground on the term "joint."

National defense science and technology institutes ought to join with industrial and trading enterprises in joint ventures for importing, for joint development, for joint tackling of key problems, and for joint management, all under the principle of "joint assumption of risks and joint sharing of profits." Since last year, this institute has formed the "Southern Aeronautic Automated Instruments Joint Company" together with the Zhuzhou Municipal Automated Instruments Plant to manufacture a scientific product--an electric flow sensor--developed by this institute in a combined research--production form; we have separately formed the "Eastern General Electrical Appliance Limited Enterprise Company" and the "Dongxiang Electronic Components Technology Development Company" with the Shenzhen Baoan Foreign Trading Company, the Hong Kong Lianhao Trading Company, and the Hunan Import Export Company. We are carrying on a multi-faceted technical trade and industrial-trading joint operations, we are engaged in computer controlled intelligent instruments, new types of light, heat, sound, electrical, and mechanical measurement instruments, as well as in sensitive components, and in the development, production, and technical servicing of computer software; we are jointly engaged with the Wenzhou Radio Devices Plant in the importation,

development, production, and operation of electronic products; we have joined with the Hunan Changde Dyeing and Weaving Plant to pool knowledge and finances and jointly run the development of new techniques and equipment for degumming ramie. After joining together in all sorts of ways, we have effectively fused together our institute's technology and superior knowledge with the advantages of factory production techniques, we have joined these things together with the advantages of marketing channels of trading departments, and with the "vast ocean" of production capabilities in civilian industry to greatly reduce the time for research, testing, production, marketing, and to hasten the process by which research achievements are transformed into production forces.

7. Seeking results from the term "quick."

In the face of the new trends toward "time is money, and efficiency is life," civilian product development by the national defense science and technology research institutes must greatly strive for higher speed to win time and be successful with "quick." In the current situation of bounding developments in science and technology and of constant changes in market trends, if development times for civilian products are long and product realization speed is slow, where it takes from 3 to 5 years to come up with something, that technology that was originally advanced will have become obsolete, and "flourishing" product sales will have "gone into decline." Therefore, national defense science and technology research institutes must have a sense of the critical, a sense of urgency, and must boldly involve themselves with the "high-grade, precision, and advanced." As far as time is concerned, we must dare to be "short, smooth, and quick," and strive to move forward amidst fierce competition, maintaining initiative, quickening the processes of "substantiation" and "transformation," and obtaining high results through short times, quick design finalization, and high efficiency.

8. Seeking a reputation for the term "service."

National defense science and technology research institutes have won a reputation for technical service that is driving, enthusiastic, thorough, and excellent. But especially for its probing, exploitative civilian product development, it cannot hope to be perfect at the beginning. Therefore, after civilian products are finalized and turned over to production, service must continue on. In technical service, we want first to hold training classes for users to allow operators to understand the technical capabilities and organizational characteristics; then, we want to do a good job at guiding production during the test production period, helping the producing factory to know well the operations functions, knowledge for maintenance training, and safety rules; third, is to replace defective parts in a timely manner, to eliminate hidden quality problems, and to guarantee a technical status whereby equipment and instrumentation regularly runs wells; fourth, is to interview users, and as early as possible get hold of information concerning the necessary changes and improvements to the original equipment. Because we are taking total responsibility for civilian product development and have managed a reputation for service down to the company level, where in the past when developing civilian products we had to "look for the rice and put down our pot," now people, documents, letters, and telegrams come all the time requesting technical cooperation with our institute, and causing the future of

our military civilian integration to be both open and broad, and civilian goods research to be more and more lively.

III.

If we are to allow the national defense science and technology institutes to be stable and successful in this changing, complicated, and competitive technology marketplace, we must pay attention to what Comrade Hu Yaobang has said: "We must have strategic vision if we are to build toward the four modernizations, and having gone the first step, must then consider the second and third steps." (Footnote 1) (Quoted from a speech at the working conference meeting with representatives of the Yuanzang project construction, published in RENMIN RIBAO, 20 December 1984) Basing ourselves on the present and looking forward to the future, we must do a good job at mid-range scientific analysis and forecasting.

1. We must do well at analyzing, forecasting, mastering, and using new and rising technologies and new and rising trends in industrial development. As we master the new technological revolution in the world today, we must have insight into directions in scientific and technical developments, trends and new technologies that might appear, and the future for new industries and the development of their applications. We can then stand on our own in the front ranks of modern technology, develop civilian products that are technically intensive, and reduce the gap between us and advanced standards in the world.

2. We must analyze and forecast well our capacities for competition and contingency. We want to both actively develop civilian products that come out on top, and to store up technology to maintain a reserve force, and we want to truly carry out the policy of "having what you do not, having better quality than you, and engaging in exchange when the quality of both is high." Information must be sensitive, contingencies must be smooth, and being normally in a state of renewal and replacement, we want to establish excellent links with civilian goods development.

3. We want to analyze and forecast well market capacities and market changes, stop blind development of "short lived" products, and allow the civilian products we develop to withstand the scrutiny of the marketplace, and sell for a long time.

4. We want to do well at analyzing and forecasting economic and social results. We want to look at social results from a broad perspective, and beginning with a microscopic view of economic results, to join economic results for the institutes with the broad view of economic and social results generated by stimulating scientific and technical advances and social development. All this must be done before the civilian products we develop can flourish.

Practice has shown that with an accepting, exploitative, and innovative spirit, and unfaltering scientific analysis and forecasting done well for immediate use, the medium range, and the long range, we will truly reach a state where "production is the first generation, development the second, and anticipatory research the third." This will allow the development of civilian

goods by national defense science and technology institutes to have products in their hands, to have markets for sales, goals for development, and an ever refreshed vigor. In the challenge of greeting the new technical revolution and the new industrial revolution, we will continue to gain new victories.

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TECHNOLOGICAL TRANSFORMATION OF ENTERPRISES DISCUSSED

Beijing HANGKONG ZHIZAO GONGCHENG [AVIATION PRODUCTION ENGINEERING]
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[Article by Li Deying [2621 1795 5391] and Cheng Lianjun [4453 6647 8823]]

[Text] During the Seventh and the early Eighth 5-year Plan periods, the emphasis of our national construction and investment will shift from the building of new units to the technological transformation, restructuring, and expansion of the existing enterprises. At present, the major task commonly encountered in the defense industry, which is at the new stage of advancing civilian-military cooperation, is finding ways to implement this principle seriously and accelerate the pace of technological transformation while adhering to the reform. To explore new ways of carrying out the technological transformation, this article presents some simple opinions regarding a few problems.

I. Great Significance of Technological Transformation in the New Situation

The great significance of technological transformation in the new situation is mainly manifested in the following:

1. There is an urgent need for technological transformation in order to bring about the total upsurge of our economic construction and to accelerate the four modernizations constructions. According to the general tasks and goals set at the 12th Party Congress of the CPC, we are now at the crucial period of laying the foundation for the economic revitalization of the next 10 years (until the year 2000). Only with the planned execution of the technological transformation and with the full exploitation of its advantages, namely small investments, quick results, and great benefits, to elevate the existing enterprises to a new technical level can these enterprises play to the fullest extent the roles of the main-force, base, and resource reservoirs and then can we be confident that the goal of doubling output will be realized. With the challenges of the emerging new technological revolution around the world confronting us, only through a technological transformation that utilizes the most current technologies that are suitable for the situations of our country to transform the existing enterprises can we raise the vitality of the enterprises and bring about the total upsurge of the national economy.

2. Technological transformation is a task of top priority in putting an end to the backwardness of the existing enterprises and improving their survivability and self-development ability. At present, there exist among our industries, including the defense industry, such widespread problems as obsolete equipment, backward technologies, aging products, and poor management. The situation can only be changed gradually through technological transformations that are carried out in a planned, orderly manner, and then the goals of raising the level of production technologies, increasing product variety, improving quality, minimizing losses, and lowering costs can be reached in order to maintain survivability and the ability to grow.

3. Technological transformation is the only way to accomplish a small input, large output, and increased economic efficiency. Currently at the national level, on the one hand, accelerating the pace of the constructions and quickly increasing and expanding production capacity are demanded while, on the other, national financial resources are limited and it is impossible to make additional investments to new projects other than the guaranteed key construction projects and those investments necessary for improving the people's livelihood. The correct way to overcome this dilemma is to accelerate the technological transformation of the existing enterprises. Absolutely no new constructions will be done if the same goals can be accomplished through a technological transformation. Experience here and abroad shows that expanding the production capacity or raising the technological level through technological transformation can save one-third of the investment and 60 percent of the equipment and material and reduce the construction cycle by half as compared to starting a new enterprise of comparable capacity.

II. Basic Principles and Goals of Technological Transformation

The goals of the technological transformation of enterprises are set on the basis of an analysis of the external environments and internal conditions of the enterprises. These analyses are based on general surveys and scientific forecasts, from which the point where the enterprise lags behind can be seen and the existing contradictions are exposed so that corresponding measures can be drawn, which form the basic goals of the technological transformation of the enterprise. Specifically, the goals of the technological transformation of enterprises can be:

1. Product transformation as the breakthrough point. The experience of the majority of enterprises suggests that a proven way of carrying out a technological transformation is to use product renewal as a lead to organize technology development, technology imports, and technological transformation into a coordinated process. On the premise of adhering to the principle of "switching to civilian needs while protecting the military," handling well the switching and selection of products and the execution of an aggressive technological transformation of enterprises, and targeting on products to guarantee the quality of products, to expand production volume, to open up product sales, and to take up domestic and foreign market shares are urgent tasks facing the defense industry at the moment.

2. A beginning of the renewal and the transformation of technology and equipment. This means to transform or replace facilities, technical equipment, and test equipment according to the requirements of the new technologies. One important aspect of the technological transformation of enterprises is the renewal and transformation of equipment and particularly facilities. In an age of extremely rapid advancements in science and technology, facilities become out of date within a shorter and shorter period of time. The renewal cycle in some developed countries has changed from around 10 years in the 1950's to around 5 years in the 1970's and the strategy has shifted from the original pursuit of acquiring more facilities to the current one of replacing facilities and raising the quality of facilities.

3. Technology improvement as the basis of the technological transformation of enterprises. That means to adopt as much as possible through trials new technologies, which include modifications of the technological process and technology distribution and the establishment of dedicated production lines, to meet the initial requirements of guaranteeing the production of high-quality products, lowering production costs, and ensuring production safety. This is an important aspect of developing new products and raising the competitiveness of enterprises. At present, important emphasis should be placed upon saving energy and reducing the consumption of raw materials.

4. Accomplishment of the modernization of business management. In the past, all talk about technological transformation was limited to technology improvement and equipment renewal, i.e., an emphasis on the renewal and transformation of hardware. In fact, technological transformation should also include raising the technical quality of workers and managers, reforming the methods of management, and carrying out the modernization of management techniques, in other words, paying attention to the technological transformation of software.

With the guidance of the national plan or the business plan, the individual enterprise should decide its own main direction of attack and its priorities based on the actual situation of the enterprise. The following principles should be followed in the process:

1. The premise of technological improvement should be adhered to. The current technological transformation should be based on new technologies and the switch from emphasizing the expansion of quantity (extension) to raising quality (intension). It should also concentrate its efforts to laying the foundation and raising the technical level. Not only equipment renewal but also technology renewal should be carried out and not only domestic scientific and technological results should be absorbed but also the foreign advanced technologies should be imported so that significant results can be accomplished on their digestion, absorption, popularization, and innovation.

2. It should be based on the conditions of our country and the actual conditions of enterprises. The conditions of our country are abundant human resources, a shortage of funds, and backward technologies. These dictate that the current technological transformation use the appropriate technologies that not only are compatible with our resource condition, technical level, and management level but can also bring about good economic benefits. The pursuit of anything foreign and new regardless of need, feasibility, or reality should be opposed.

3. It should center on improving the economic benefits of enterprises. Pursuing economic benefit is the bottom line of any economic activity. In the process of the technological transformation of enterprises, by combining technology with economy and quantity with quality, immediate goals with long-term goals, and local situations with overall situations, should be fully implemented and scientific validation, elaborate organization, and strict management can be accomplished.

4. It should serve the needs of the adjustment and reorganization of industries and the overhaul of enterprises. The technological transformation of enterprises cannot be carried out in isolation. Technological transformation plans should be formulated according to the changes in the trend of product and service areas, the adjustment of the product mix, the feasibility of specialization of the organization, and the possibility of its cooperation with others.

III. Drawing up of a Good Technological Transformation Plan

The technological transformation of enterprises is a comprehensive task that covers wide areas, heavily involves policies, and is highly technical and economic in nature. To insure that the tasks of technological transformation are carried out smoothly and orderly, it is important to concentrate all efforts on making a good overall plan of the technological transformation of enterprises and setting long-range plans and goals.

For enterprises, the technological transformation plan should be subject to the guidance and needs of the national, business, and local plans. The local and business plans are the major grounds for drawing up the technological transformation plan of the enterprises.

The technological transformation plan of the enterprises should include in general the following:

1. Forecasts of the individual enterprise's future domestic and foreign market demand and the trend of technology development within a certain time period (5-10 years).

2. Overall analysis of the technological and production conditions of the individual enterprise and the setting of specific targets in the areas of variety, quality, technology, costs, service, production volume, exports, profit margins, and labor productivity to be met after the completion of transformation.

3. In-depth analysis of the situation and tasks facing the individual enterprise. On the basis of giving full consideration to the possibility of cooperating with other specialized organizations, the preliminary transformation plan should be proposed and clear targets be specified for the items identified for transformation.

4. Technical and economic validation. That means to carry out a comprehensive analysis of the feasibility of technology and of how advanced and economically reasonable the technology is. The recovery period of the technological transformation investment and the profit margin should also be estimated.

5. Formulation of measures that are to be implemented in response to the managerial, material, energy, and technical personnel needs of carrying out a technological transformation plan.

In the process of formulating and implementing a technological transformation plan, the following key relationships should be properly handled:

1. The relationship of technological transformation and normal production. The technological transformation of the existing enterprises is to be carried out under normal production conditions, so it is essential that transformation and production do not hold each other up. Therefore, when formulating a technological transformation plan, production guarantee measures should be included. And during the implementation it is necessary to coordinate with the production schedule. In arranging the current production, favorable environments for technological transformation must also be created and efforts must be made to achieve a transformation while producing and to generate output while making inputs.

2. The relationship of key and general technological transformation items. The key technological transformation items are those essential parts or important links most crucial to the enterprise and should be given priority in the assignment of technical personnel, construction planning, and the supply of resources. However, those general items already in the plan should also be accomplished by all means, particularly those facilities supplementary to the key items, and the coordination between them should be maintained.

3. The relationship of single-item and integrated transformation and of enterprise, business, and local transformations. In recent years, along with a better understanding of the importance of a technological transformation, the majority of enterprises have begun to change the piecemeal approach and turned from a single-item and single-enterprise transformation carried out in isolation to the new stage of comprehensive transformation that covers the whole area and cuts across business lines. This requires a constant alertness to new situations and prompt adjustments made accordingly so that the technological transformation can be carried out in a coordinated manner.

4. The relationship of immediate and long-range goals. The technological transformation plan consists of immediate, short-term, and long-term plans so that each transformation item is required to meet current needs and to be beneficial to future development. During the technological transformation, it should, with the best efforts, avoid creating new irrational situations in the areas of technological process modification, the reorganization of productivity, and the design of management and information systems.

IV. Good Choice of Technological Transformation Plan

For technological transformation to play the role of improving economic benefits, correct decision-making and a good choice of a technological transformation plan are necessary. What follows are several currently used quantitative evaluation methods, which are useful in plan selection.

1. Useful life-cost analysis. For a certain plan, it is hoped that, beyond satisfying certain goals and needs, its purchase price or manufacturing cost will be low and it will be cheap to maintain and operate after installation. The sum of the purchase price or manufacturing cost and the overall maintenance and operating costs incurred during its possible or economic life after implementation of the plan is generally termed the life-cycle cost. The average annual cost throughout its estimated or economic life is one of the indicators used in evaluating plans.

$$\text{Average annual cost throughout useful life } (F_T) = \frac{\text{Life-cycle cost } (F)}{\text{Estimated useful life } (T)}$$

It is obvious that those plans with smaller F_T values are lower in the useful life-costs and therefore are good plans.

2. Useful life-gain analysis. This complements the above-mentioned method. The useful life-cost analysis compares the average annual expenses of the life-cycle cost on the assumption that gains and operational requirements are identical while the useful life-gain analysis compares the average annual profit throughout the useful life on the assumption that the life-cycle costs are identical. The formula of calculation is as follows:

$$\begin{array}{l}\text{Average annual gain}\\ \text{throughout useful life } (Y_T)\end{array} = \frac{\text{Total gain throughout estimated life } (Y)}{\text{Estimated life } (T) \text{ or economic life } (T_Q)}$$

The assessment is that the larger the Y_T the better the plan. When using this indicator, gains can be profits or operating cost savings.

3. Overall efficiency comparison. This method combines the above two and is an indicator that reflects in a more thorough and comprehensive way the economic rationality of technological transformation plans. The formula of calculation is:

$$\text{Overall efficiency } (\rho) = \frac{\text{Total gain throughout estimated life (Y)}}{\text{Life-cycle cost (F)}}$$

or

$$\rho = \frac{Y_T}{F_T}$$

It is obvious that the larger the indicator the better the plan.

4. Investment recovery period comparison. The investment recovery period is the time required to recover the initial investment in a technological transformation plan in terms of the average annual gains throughout its life after implementation of the plan. The formula is:

$$\text{Investment recovery period } (\tau) = \frac{\text{Total investment in the plan}}{\text{Average annual gain after implementation}}$$

Plans with a shorter recovery period are better. It must be cautioned that the calculated τ values have to agree with the standard recovery periods specified by the state or business. The standard revovery period for general machinery has been reduced to about 3-5 years. This mainly allows the situation of accelerated depreciation concurrent with the rapid advancement of technology. Although currently there is no generally agreed standard in our country, a recovery period of less than 10 years has already been a minimum requirement.

5. Assessment of the recovery period for additional investment. When using the investment recovery period comparison method, the best choices are those with a smaller investment and a good average annual gain. But there are cases in which plan A requires a large investment with a high average annual gain while plan B is exactly the opposite. It would be very difficult to compare by the investment recovery period method and should be evaluated by the additional investment recovery period method. The formula is:

$$\begin{array}{l}\text{Additional investment}\\ \text{recovery period for plan A}\end{array} = \frac{\text{Plan A investment} - \text{Plan B investment}}{\text{Plan A annual gain} - \text{Plan B annual gain}}$$

If the calculated additional investment recovery period is within the standard recovery period, it means that the additional investment in plan A can be recovered from the additional annual gain of plan A within that period of time. Therefore, plan A is better.

6. Investment return ratio comparison. This uses the ratio of the average annual net gain under normal conditions after the complete implementation of a certain technological transformation plan to the total investment in the plan as the basis of evaluation. In fact, this indicator is more or less a reciprocal of the investment recovery period indicator. It means, in economic terms, the annual profitability of the investment. The larger the value the better the plan.

The above-mentioned indicators are often used in evaluating economic rationality. In addition, there are "critical production analysis" and "cost conversion comparison" methods that are also useful for economic assessment. When comparing plans, the advanced degree of technology is also an important consideration. The following methods are suitable for this purpose:

7. Listing of advantages and disadvantages. The advantages and disadvantages of each plan for a particular technological transformation item with regard to its technical characteristics are thoroughly listed and the chances of overcoming the disadvantages are analyzed. After comparing the advantages and disadvantages, the plan with the most advanced technology is chosen. Though simple and flexible, this method is rather unsophisticated and lacks a quantitative basis.

8. Scoring method. Based on the technical natures of technological transformation items, a number of evaluation items that reflect certain aspects of the technology are chosen and the grading guidelines for each item are set. The grading is carried out by a group of experienced professionals. The technology assessment values are calculated by the following formula:

$$X = \frac{P_1 + P_2 + \cdots\cdots + P_n}{n \cdot P_{max}} = \frac{\overline{P}}{P_{max}}$$

where: X is the technical assessment value.
$P_1P_2..P_n$ are the scores of individual assessment items.
P_{max} is the highest possible score.
n is the number of assessment items.
$\overline{P}$ is the average of all scores.

Obviously, the plans with the highest X values are the best. In actual practice, depending on the additional manipulations of the scores, there are the addition score method, serial multiplication score method, and weighted score method.

All the methods mentioned above, particularly methods 1-6 used for economic assessment, are static evaluations, because the time factor of capital is not taken into consideration. Those methods that do take into account the time factor of capital are generally referred to as dynamic assessment methods. Those belonging to the category of dynamic assessment methods include the net current worth comparison method, the benefit cost ratio comparison method based on current values, and the internal profit margin calculation method. The common feature of these methods is that the interest factor of capital is given full consideration according to the principle of compound rate calculation, which will not be given a detailed discussion in this article.

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NEED FOR LEGISLATION IN TECHNOLOGY MARKETPLACE

Fuzhou FUJIAN LUNTAN in Chinese No 7, 5 Jul 85 pp 52-54

[Article by You Quanrong [3266 0538 2837]: "A Brief Discussion of Technical Market Legislation"]

[Text] The opening up of scientific and technical markets is an important matter in the resolution by the Central Committee to restructure the science and technology system.

Science and technology is a special kind of technology that before it has actually been used in the production process is a production force that exists in the form of knowledge. Only by converting it to labor and technical ability, only when it materializes into a means of production and enters into the production process, can it then transform into a real production force. Therefore, there is after all an organic, internal relation between science and technology on the one hand and production on the other, and there ought to be many channels for lateral relations. But as it happened, the former science and technology system cut off the relations that formerly existed between science and technology and production, which severely severed the ties between them and obstructed advances in science and technology and development of the economy. So, the primary tasks for reform of the science and technology system are in changing the status of those ties, in reestablishing the relations, and in clearing various channels for science and technology to cater to production. This will allow the achievements of science and technology to become real production forces as quickly as possible. The breach will be in opening up socialist technology markets for exclusive scientific and technical products, which is an objective requirement for the development of socialist commodity production, and is a necessary outcome of the commercialization and socialization of science and technology.

The science and technology market is a place in which scientific and technical achievements are exchanged. It is an intermediary link in the circulation and exchange of technology, and is the basic path for the commercialization of science and technology. This is not the same as the general commodity market: in the first place, what is exchanged on the technical market are the achievements of technology. Those are a special kind of commodity, they are chiefly an achievement of mental labor, are intellectual constructs that are optimized and systematized, and that in ordinary circumstances are manifested

in the forms of blueprints, data, and material; the practical results are anticipated, unlike those of general commodities, which are directly observable, and can only be realized after certain physical efforts. Second, offerings on the technical market are abundant, primarily in the form of technical cooperation, compensation for rights, service, interchange of information and talent, and various couplings of scientific research and production; those items that are exchanges are both inventions and creations, and also reworking of old technology; there is both buying and selling of individual technologies, and the transfer of entire packages of technologies. Then, too, those participating in the technology market include the state, collectives, units, and individuals, as well as joint bodies that transcend regions, departments, and professions, and also foreign customers. Finally, scientists and technicians in the marketplace will always be the "dowry" of a technology, to be transfered with the technology or to be hired to help with the assimilation of the technology. It is obvious that the science and technology market is different from the general commodity market, and has its peculiar characteristics. To ensure its flourishing and development, it is essential to enhance management with legal means, and through legislation to make clear the guiding ideology and particular standards of behavior for the technical marketplace, to inform people of problems concerned with the technical market, what it is the state encourages, what it prohibits, and the consequences of violating the law, all of this to make a basis in law and to have regulations to follow.

I. Standardize and legalize the resolution of the Central Committee regarding the restructuring of the science and technology system.

Comrade Peng Zhen [1756 4176] once pointed out that if the state is to rule long and peaceably, then it must shift from sole reliance on policy to working according to law. Party policies serve an enormous function in all facets of our state, but they are standards for guidance and appeals, and are not like laws that are formulated and approved by a nation, and that ensure measures with the force of the state. Therefore, if we are to manage well the technology marketplace, having only policy is insufficient. We must instead act according to law, for which we must legalize the resolution by the party Central Committee concerning restructuring of the science and technology system to provide it with the effects of the law, and to allow it to become the "fundamental law" for scientific and technical legislation.

The "fundamental law" must first clarify the legal nature of the science and technology market. Marxism holds that the nature of a marketplace is determined by the production relations, that it is determined by publicly held socialist production modes. The commodity market in China is a socialist unified market guided by planning, that is based on a state-run and collective economy, and that is supplemented by an individual economy. Although the socialist technical market is regulated by the laws of value, and there is free exchange between buying and selling parties, it still cannot avoid the restrictions of the laws of a socialist based economy, nor the laws, policies, or programs of the state, and the economic means of national taxation, financing, and pricing are always serving as levers of regulation. Because of this, the rising new technology market is an organic organization component of the socialist unified commodity market planned on the basis of public

ownership. It is a place for the exchange of technical commodities that is regulated by national laws, policies, and programs.

Also, "fundamental law" must clearly formulate the basic principles for the technology market, and these should include: principles for developing science and technology and for stimulating economic construction, principles of equality and mutual benefit, principles for compensation for equal value, principles for safeguarding the legal rights of parties to litigation, and principles for the integration of planning guidance and market regulation.

II. Establish "series law" concerning the scientific and technical market that will revolve around scientific and technical "fundamental law."

If we are to truly have law as a basis, then it is insufficient to have only fundamental law, because what is provided for in fundamental law are only the standards for principles that regulate the technology markets. Since the matters with which the technology markets are concerned are abundant and far reaching, there are many particular problems. Only by facing particular problems on the basis of fundamental law, by formulating "series law," and by allowing the laws and regulations that regulate the technical market to constitute a "law group," can the technical markets be effectively regulated. Within this "law group" and "series," what we want to formulate in earnest are "Contract Regulations for the Transfer of Rights to Technology" and "Laws and Regulations for the Management of Scientific and Technical Markets."

1. Contract Regulations for the Transfer of Rights to Technology. The chief clauses of this are already in paragraph 26 of "Economic Contract Law" and in the third paragraph of "Provisional Regulations" of the State Council regarding the transfer of rights to technology, where the provisions are somewhat clearer. What we must especially stress here are the following two problems:

First, is the problem of the legal positions of parties to litigation. Parties to contracts for the transfer of rights to technology may be legal entities or may also be natural persons, and they can even be a partnership of natural persons or a joint operation of legal entities. They may be citizens of China with legal entities, or they can be foreign customers. The legal position of parties of all parts in the process of transferring the rights to technology are uniform and equal. There may not be any difference due to the size of the unit nor to differences in economic nature nor mode of operation, and even more, it is not permissible for any unit or individual to infringe upon the legal rights of others. Under the general principles of compensation for rights of transfer, the rights and obligations between the parties are completely equal, and after one party has provided a certain compensation, it has the right to obtain the technical achievement of the other party, as well as to use it in production; after the other party has obtained compensation, it has the obligation to turn over the technology to the other party. In the same line of reasoning, if one party wishes to obtain technology, then it must provide compensation, while after the other party has turned over technology, it then has the right to compensation. What is worthy of note here is the question of the legal position of intermediaries in the technical market. Whether the intermediary is an agent commissioned by one party, or is a

temporarily appointed contact person, and whether or not it is an individual or a group, they function to collect and disperse technical commodities. Their activities hasten the diffusion of technical commodities and their transformation into production forces, they are familiar with connections between technology and production, the service they provide generates timely effects for technical commodities, and it is valuable labor. This kind of labor ought to be reasonably compensated, and ought to be protected by law.

Second is the problem of security in transferring the rights to technology. Patents have already been requested for some of the scientific and technical achievements transfered in the technical market, while some are unpatented exclusive technologies. There is obviously no "security" problem for the former, for the seller has already made a detailed description of this technology in the patent application or in the instruction manual. The buyer need only turn over the purchase price to obtain usage rights to the technology; the situation for the latter case is not the same, because exclusive technology has no legal protection like that for patent rights. The technology is not public, but is secret, and once the substance of the technology is made public, it may be used by anyone. Therefore, the seller cannot unqualifiably make public his secrets. But if the buyer on the other hand is not aware of the product's performance (its degree of advancement and practicality) then he will naturally not dare to buy it, upon which arise the problem of technical "security." One way to solve the "security" problem for exclusive technology would be that after the buyer has obtained a certain technology, the seller would guarantee that under certain production operational conditions the buyer can realize the results agreed upon. If the buyer cannot obtain the results agreed upon due to a defect in the seller's technology, the contract becomes void, and the seller must compensate the buyer for losses incurred by "testing" this technology. There are many particular problems with this method and there may be many difficulties in putting it into practice; another method is to refer to the way it is done in international technology trade, where after the buyer guarantees not to divulge secrets, the seller reveals the "secret" of the technology beforehand, and when the two parties have come to an understanding, they reach an agreement. When they cannot come to an understanding and there is no way to reach an agreement for transferring the rights to the technology, the buyer ought to preserve those secrets, and if they divulge them or take them over for themselves, they ought to assume the responsibility for compensation.

2. Laws and regulations for management of technical markets. The primary goals for management of technical markets are to protect the normal order of the marketplace, to protect the legal rights of contractual parties, to guarantee the prosperity and development of the markets, and to encourage the advancement of science and technology. Therefore, laws will provide for such questions as which units may exercise management rights over scientific and technical markets, and how market management is to be carried out. It is my opinion that the legal management of science and technology markets chiefly includes contract management, pricing management, and taxing and financial management.

Contracts for making over the rights to technology are the core system for the technology market, and management must be strengthened. Relevant departments

ought to set up systems for reviewing, approving, and registering contracts. They should review contracts to see if they are legal, and should ban those contracts that violate such laws and regulations as "Patent Laws" and "Rules for Contracts Transferring the Rights to Technology." They should also protect legitimate operations, prohibit illegal exchange, and take care of behavior that infringes upon a party's legal rights and of disputes that arise through contracts.

The problem of pricing is an important problem in the transfer of rights to technology. This concerns the economic results of both the buying and selling parties, for which appropriate management should be exercised. When prices are too high, the burden on the enterprise is heavy and buying power is limited, which is not beneficial for the timely dissemination and application of technology; when prices are too low this is of no advantage for arousing the enthusiasm of research departments and of scientists and technicians. Therefore, to formulate appropriate pricing standards would be an important matter for technology market management laws and regulations and for reasonable management of pricing. In the present situation where there are no commodity pricing laws, we can make some superficial resolutions on principle for pricing the transfer of rights to technology based on the degree of advancement of a technology, its applicability, and its ease of use, and with regard to the economic results that the technology might generate for the applying department. But because the technology markets have just arisen, for the time being we cannot nor need we provide for a unified pricing, but can allow the pricing to be chiefly regulated by the market, and within the scope of the basic principles, determine prices based upon the market conditions of supply and demand and on pricing regulations, and permit them to float.

Beside contract and commodity price management, legal management of scientific and technical markets also includes passing such economic laws and regulations as tax law and financing laws, using the methods of tax revenue and credit, managing the technical markets macroscopically, enthusiastically supporting the development of technical markets, and overseeing the activities of the scientific and technical markets.

It should be pointed out that at the same time we are legislating the science and technology markets, building a legal system for science and technology that is related to the legislation of technical markets and to other aspects of the technical markets ought to be undertaken at the same time. This would include things like the exchange of personnel, a contract allocation system for scientific research, an internal responsibility system for scientific units, and for the integration of research units with society. Otherwise, legal regulation of technology markets will be hard to implement because the conditions are not right.

It should be pointed out that in addition to this and at the same time that the legal system is being perfected and that we are enhancing scientific and technical legislation, we must also pay close attention to judicial law. After the founding of our country, China announced a great number of laws and regulations for science and technology, as for example, "Regulations for Rewarding Inventions in the Natural Sciences," and "Provisional Stipulations Regarding the Transfer of Rights to Technology," and in keeping with a full

scale development of the reform of the science and technology system, even more scientific and technical legislation will appear. These laws and regulations, together with economic contract law and laws relating to pricing, finance, and taxation, must all be followed in the activity of the scientific and technical markets, and they should be strictly and earnestly carried out. Various problems that appear in exchanges of technology should be dealt with legally in a timely manner, and behavior in violation of the law should be punished in accordance with the particular circumstances. The recently implemented "Patent Laws," especially, will have very important significance for encouraging people with their inventions and creations, for stimulating the development of science and technology, and for the importation of foreign advanced technology. Earnestly implementing patent law, the method of bringing the technology market to a trade that primarily uses patents and licensing, will be beneficial to the healthy development of mobilizing the technology market.

Finally, initiating technology markets involves a series of legal questions. Therefore, it is just like enhancing the scientific and technical service in the technology market: in order to ensure the prosperity of the technical market we must put great effort into enhancing legal service. If legal advisors participate in the discussions, exchanges, drawing up of contracts, and the review of contracts in the scientific and technical trade in the market, witnesses, notaries, and patent lawyers for the technical exchanges will provide patent agent service, lawyers will participate in the litigation of disputes in technical trade, and they will provide various legal services for international economic and technical cooperation and interchange, etc.

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SHENZHEN SUGGESTED AS SITE OF CHINA'S 'SILICON VALLEY'

Shenzhen SHENZHEN TEQU KEJI [SCIENCE AND TECHNOLOGY OF SHENZHEN SPECIAL ZONE] in Chinese No 2, Apr-Jun 85 p 32

[Article by Senior Engineer Li Haoqi [2621 3185 2769]: "China's 'Silicon Valley' Should Be Built in Shenzhen"]

[Excerpt] As the largest special economic zone in China, Shenzhen has from its very inception chosen electronics as the key industry for its own development. This is a very bold and far-sighted choice. Electronics is a new and highly technology-intensive industry. As some foreigners said, it is the "heart of high technology." In the "silicon valley" of the United States, for example, PhD's alone number as many as 6,000! Not long ago, some people suggested that China's "silicon valley" or "silicone island" be built in Xiamen or Sichuan. According to the layout of the electronics industry and its development in Shenzhen, however, I am of the opinion that Shenzhen should be the place of the electronics industry and its development should be the place with the broadest scope, the most rapid development and the best conditions for this purpose in the country. In a short period of slightly over 2 years, not only Shenzhen itself, but also the Ministry of Electronics Industry have built their own electronics corporations here. There are also more than 60 other related electronics enterprises with more than 40 production lines, capable of producing and assembling more than 100 electronic products of a complex technical nature, including computers, micro-processors and color TV sets. In consideration of the realities of China and the requirements for its strategic development, therefore, it would be appropriate to build a "silicon valley" here as the transitor industrial center of China. In addition, Shenzhen has the following advantages which are denied to other places.

First, it is close to Hong Kong. This geographical advantage must not be overlooked. Hong Kong is one of the four large free economic centers as well as the largest free trade center and port in the world. Its economic propserity is inseparable from the concentration of advanced sciences and technologies of the world in Hong Kong and its prompt access to information. Through Hong Kong, we can not only import the world's advanced electronics technology and obtain the most up-to-date information in various fields without any loss of time, but also sell our electronic products directly in

Hong Kong, or in the world market through Hong Kong. The closer the place of production is to the market, the better the economic results.

Second, it is close to Guangzhou, one of the largest export trade centers with good transportation facilities in the country. The Guangzhou Nonferrous Metal Research Academy, on of the two largest nonferrous and rare-metal scientific research centers in the country, is located in Guangzhou. In addition, there is the Guangzhou Transistor Material Research Institute which has developed from the transistor material research section of that academy. The scientific and technological resources of these two units are quite abundant. Through this academy, we can obtain the best technical resources in the production of transistor materials and in scientific research. There are scores of institutes of higher learning in Guangzhou and most of them are specialized in electronics and metallurgy. They can help Shenzhen with the supply and training of highly technical personnel.

Third, for the development of the electronics industry, we must be sure that many varieties of nonferrous metals and rare metals are available. Color televisions, for example, cannot be made without flourescent materials, while many electronic products need magnetic materials, transistors and other metals, all inseparable from nonferrous and rare metals. Known as the "native land of rare metals," Guangdong has the unique natural advantage of abundant mineral resources, including material foundation for the development of an electronics industry and will provide Shenzhen with the required resources for all-round development of this industry.

Under these conditions, there are great and comprehensive advantages and a very good foundation for a "silicon valley" with the Chinese characteristics to be set up in Shenzhen, in its all-round development of the electonics industry. Furthermore, Shenzhen's experiences of success in "importing investments from abroad and forming laterial ties at home" and the advanced technologies and funds it has brought in will certainly help speed up the building of its "silicon valley." In the U.S. "silicon valley," for example, there are more than 100 corporations run by Chinese people, and we can make an effort to establish connections with them and to win their cooperation.

On the whole, I believe that we should set up China's "silicon valley" in Shenzhen as an important strategy in meeting the challenge of the new technical revolution of the world.

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BRIEFS

CHINESE CUSTOMS' TECHNICAL RENOVATION--China will adopt advanced technologies in its customs service during the Seventh 5-Year Plan period when a nationwide computer network and an information network together with laboratory and other inspection facilities will be basically completed. The technical equipment of Chinese customs will be modernized. According to JINGJI RIBAO, the technical equipment for Chinese customs has continued to improve in the past several years. More than 4,000 units (sets) of technical equipment have been installed in the country and the equipment for computerized communications and scanning is now fairly complete. In places where traffic is heavy, a computer system with hundreds of scanning terminals has been set up for checking imported and exported cargoes and postal parcels, levying taxes, searching for contraband goods, and compiling statistics. The use of this equipment has raised customs efficiency and speeded up the work of checking, but the technical modernization is still inadequate for it increasing workload. [Text] [Beijing RENMIN RIBAO OVERSEAS EDITION in Chinese 9 NOv 85 p 1] 9411/13068

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32D ISSCC ANNUAL MEETING HELD

Beijing DIANZI KEXUE JISHU [ELECTRONIC SCIENCE AND TECHNOLOGY] in Chinese Vol 15 No 9, 10 Sep 85 pp 33 - 37

[Article by Jiang Yongning [5592 3057 1380], Electronics Research Institute, Ministry of the Electronics Industry]

[Text] The 32nd International Solid State Circuit Conference (ISSCC) was held in New York from 13-15 February 1985. Hosted by the IEEE, this was the first large-scale conference to address the problem of higher-density memories, which indicates that semiconductor technology has already entered the era of very large-scale integrated (VLSI) chips (256k memories) and is advancing toward ever-smaller microdevices. At the meeting specialists exchanged information in four areas: special-purpose memory devices, high-density SRAM, nonvolatile memories, and megabit DRAM devices, and the reports reflected the current state of the art in circuit density and precision. By contrast with last year's conference, in which only three reports discussed megabit DRAMs, this year megabit DRAMs were the subject of 10 reports; these devices are becoming more important and have entered the experimental testing stage. Considerable speed improvements have also been made in 256k static RAM devices. Wave filters, analog techniques, integrated circuits with high power consumption, and digital converters were introduced at the meeting, indicating that production and design advances in these areas continue to be of great importance. Particularly encouraging was the fact that NMOS and CMOS silicon devices are reaching speeds formerly achievable only through the use of silicon bipolar and GaAs MESFETs.

Professor R. Reddy of the Carnegie-Mellon Institute gave an invited talk on "Super chips possessing artificial intelligence," in which he discussed specialized topics. He sketched out future developments likely to stem from work now underway in developing systems with artificial intelligence (AI). He stated that rather than resorting to the large-scale computer calculations required in the past, one can now use VLSI technology to design single chips for CAD (computer aided design), i.e., chips which are capable of drafting and distinguishing among circuit diagrams of entire systems and able to manipulate and transform diagrams automatically, test the system automatically, and assess system performance. He envisaged a future when such superchips will contain a billion transistors and make it possible to fabricate a 100 megabit shared memory together with 100 independent processors on a single chip, whose operation will rely on analog-to-digital, digital-to-analog, and internal networks.

A chip with a million transistors might comprise a CPU, floating point processor, external processor, virtual memory management device, and high-speed cache memory; it would be capable of replacing four or five ordinary chips. Thus a chip with 100 million devices could contain 100 different processing systems. Some advanced AI research now requires extensive computational tools capable of a billion instructions per second (BIPS) and memories able to store a billion words. Thus the availability of "superchips" containing a billion circuits and 100 processor systems, each equipped with its own memory, could meet these needs. He predicted that by the end of this century, "secretarial assistant" systems equipped with artifical intelligence would appear in offices. These systems would contain word processors (with spelling checkers and proof-reading facilities), dictionaries with up to a million words, grammar and phrase checkers, and encyclopedic information; they would respond to spoken input and contain knowledge databanks. Of course, a great deal of capital will be needed to produce superchips with artificial intelligence, but Prof. Reddy believes that all the necessary prerequisites are now in place.

In what follows we will briefly summarize the papers given at the 17 workshops held during the conference and consider their implications for the future trends in research and development in solid-state circuits.

1. Microprocessors And Floating Point Processors (4 Papers)

Advances in microprocessor design are reflected in their larger (32-bit) structure, the availability of memory management and floating point support chips, and their faster clock speeds (up to 40 MHz). The reports discussed the design and characteristics of these devices, and problems of standardization. In addition, programmable microcontrollers designed from 8-bit control processors are used in biology and medicine as cardiac pacemakers. The design of floating point elements has focused on complex devices with special capabilities. It has proved particularly fruitful to regard a floating point unit as a fully parallel high-capacity multiplier; devices capable of operating on both floating point and integer BCD data have also proven to be effective.

2. Dissipative Integrated Circuits (7 Papers)

Signal demodulators and synthesizers operating in the 700 MHz to 1.2 GHz range based on various kinds of integrated circuit techniques were introduced in the talks. One area of progress was in the use of bipolar isolated-junction technology to fabricate phase-locked loops (PLL), thereby permitting operation at up to 700 MHz. A second advance was to use 1.8 u NMOS devices to design PLL's operating at up to 1.2 GHz. A third advance involved the design frequency synthesizers based on programmable GaAs frequency dividers (the operating frequency was again 1.2 GHz). In addition, miniaturization and cost-cutting measures in the integration process were discussed, such as the fabrication of a radiofrequency (3.5 GHz) television tuner on a single bipolar chip, or of a single-chip servo system with two epitaxial thin-film layers--this servo can be used in video cassette recorders and replaces four older chips. In addition, integrated frequency synthesizers used as tunable local oscillators are now employed as digital tuners in television sets, mobile/cellular radios, direct-broadcast satellites, and high-speed (1-meter-band) modems. This equipment can

This equipment can also be used for FM transmission in a single system; because these components are integrated, parasitic effects in the circuitry are decreased, and the power consumption is also decreased.

3. Special-purpose Memories (7 Papers)

This specialized area was scheduled first at this year's conference; it was thought that an exchange of information on the design of memory circuits and logic might serve as preparation for the discussion of new intelligent memories. CMOS technology employing double metallization and line widths less than 2 um was discussed, along with the design of circuits for which the conventional distinction between memory and logic is blurred. The primary significance of this is to enhance the functional capabilities of the devices rather than to increase the storage densities. These high-performance memories are suitable for special applications. There are two types of applications of DRAM devices used in high-resolution plotting systems--for conventional random access storage, and for fast serial output. They can be used to permit graphics processors to correct images on a CRT or printer; the RAM channel is uniquely well suited for imputting bit-addressed graphics and can be used to record entire scenes, for drafting, or to change colors. Alternatively, megabit ROMs using 1.5 u geometries and bimetal CMOS technology are now employed in 16-bit microcomputers, the associated logic circuits use Hamming error-correcting code, the word size is 64 bits, memory access time is 50 ns, and higher circuit densities are achieved through address and data multiplexing. A memory chip organized as 256 x 32 bits is designed for data-driven processing systems, and more-advanced 2k x 9 bichannel memories are now available for multiprocessors. On-chip random circuitry is available for signal discrimination and cycle control. Error rates due to radioactive decay are 100 FIT (10^{-7}/hour, and storage time is less than 150 ns. In addition, 128k EPROMs now make it possible to make changes in stored programs. In addition to EPROM arrays, the EPROM chips also contain encryption logic circuitry, 64-bit memory, and a pseudorandom number generator. During reprogramming (before permission is granted to read data), the hardware generates a random signal, after which the old contents are compared against those of the new EPROM program and altered accordingly.

4. High Density Static Ram (6 Papers)

Bipolar and CMOS storage devices of area 100 u^2 were discussed at the conference for the first time. Previously, CMOS was relegated to high-density static RAM technology; important advances have been made in extending the capabilities of the devices (decreasing the width of the gate signals) and reducing the internal contact resistance. Of course, advanced technology was crucial in these advances. In former years, the use of redundant bits in 64k devices was discussed, but this year they were mentioned less often in connection with the 256k devices, which in addition to their higher density (256k) also boast storage times of less than 20 ns, die areas approaching 70,000 mil^2, and linewidths of 1.2 u.

5. Data Converters (5 Papers)

The new technology can be seen in 8-bit high-speed converters. Previously, 255 comparators were required to design a fast A/D converter, whereas today only 16

are needed using bipolar high-speed converter technology. Test results for this type of data-quantizing ("approximate solution") devices were reported for the first time; in previous years, fast converters with optimum properties were fabricated using high-speed bipolar technology, while today the same performance can be achieved with CMOS techniques and 2 - 3 u line widths. In addition to their rapid implementation in fast converters for video circuits, these improvements may also lead to single-chip video subsystems with logic, storage, and data-conversion capabilities.

6. Signal Processors (5 Papers)

The primary emphasis here is on the development of all types of analog signal-processing hardware, such as surface acoustic wave (SAW) devices, charge-coupled devices (CCD), and switched capacitor filters. Nevertheless, new applications in the area of filtering, frequency-sharing, modulation, and detection are constantly becoming available thanks to rapid developments in A/D convertors and digital VLSI technology. The 8 x 8b 16-nanosecond paralled multiplying devices using submicron NMOS technology are an outstanding example; others include the use of logic circuits with four digits of precision to simplify the design of imaging circuitry; optical character recognition devices for preprocessing; devices which reconstruct waveforms from sampled data and special values. All of these devices are characterized by new circuit designs and chip structures. In addition, programmable digital signal analyzers are now available; their superior signal-processing accuracy makes them of great interest, and they will play an important role. A 2.4 u NMOS multiplier/adder operating in a single instruction cycle, a 1.5 u NMOS 32-bit floating point processor, and 2k/b ROM and 4k/b DRAM devices (among others) were discussed and their signal-processing applications considered.

7. Image Transmitter-receivers (5 Papers)

VLSI technology is not yet as important as MOS technology in the development of image receivers/transmitters. Crystal purity and noise suppression are two important issues that must be addressed for applications to television receiver/transmitters. The reports discussed the development of CCD devices for video cameras; one type is designed to be as small as possible, while the other emphasizes high resolution and high aperture. Another paper discussed a new idea, according to which improved charge control can be achieved by using a converter electrode. In addition, a read-out device was discussed which uses three CCD RTs arranged in a linear array; this device can also be used to transmit facsimiles without any need to add optical attenuating lenses. Finally, low-noise CMOS detector circuits and total-derivative modulators were discussed (these devices are required in laser acoustooptical signal-processing systems, Bragg-reflection devices, and optoelectronic diode arrays).

8. Flexible Digital Arrays (5 Papers)

Developments in computer-aided design (CAD) and the widespread use of flexible digital array structures prompted the discussion of how to make multipurpose CMOS gate arrays more flexible. Extended wiring, tripolar interconnections with metal connectors, elimination of signal path constraints, and the use of

continuous component arrays were discussed. Hybrid structures combining ROM, RAM and logic, and interactive design systems are generally used by designers. These systems, which generate designs that can be inspected and tested by the engineer, are composed of scanning flip-flop circuits combined with a system that can automatically calculate input/output parameters according to designer specifications. Other types of flexible structure discussed included CMOS erasable logic programmable arrays based on UV-erasable N-trench devices, in which a NOR gate circuit is used to implement AND, OR, and XOR logic arrays.

9. Operational Amplifiers and Voltage Stabilizers (7 Papers)

These papers stressed that even though traditional logic circuits are now being replaced by digital methods in silicon technology, operational amplifiers are still used in critical input circuits to match converter output signals to the levels required for input to A/D converters; power transistors are used in the output circuit to drive the transmission components. Many of the special characteristics of the logic circuitry are possible only through the design of custom circuits; however, the latter are also influenced by advances in silicon technology. For example, Bi-FET technology is used to design fast operational amplifiers; high common-mode rejection ratios and low internally regulated compensation voltages can be achieved by using improved methods for designing input circuits. The following topics were also discussed 1) input and output considerations for low-voltage operational amplifiers; 2) PNP, NPN differential operational amplifiers; 3) the properties and applications of bipolar devices with dielectric insulation in hybrid circuits; 4) a 150 W operational amplifier with an improved class-B output circuit in which crossover losses are avoided by using a complementary output stage design. CMOS-compatible transverse bipolar transistors are used in voltage stabilizers with nearly constant current gains.

10. Communication Links (5 Papers)

Digital techniques are currently being implemented in long-distance communications. As digital networks have become more highly integrated, two specialized techniques have evolved to handle problems in digital code transmission along telephone cables made up of twisted wire pairs. The first technique involves digital mixing, while the second relies on time-compression and multiplexing. The reports analyzed these problems and transmission techniques and also considered fiber-optic communications, which will be developed in the future. Using optical fibers or twisted-pair cables was recommended as the most promising approach for rapid transmission of all kinds of data (speech, facsimiles, TV signals, digital data, ...). The use of integrated quad-cable transmitting and receiving systems in local loops was also expounded.

11. Nonvolatile Devices (8 Papers)

The nonvolatile MOS memories are of the ROM, UV-EPROM, and EEPROM variety. In terms of cost and range of applications, bipolar PROMs are competitive with ROMs today, while EEPROM technology is reaching maturity. The speakers discussed the state-of-the-art and properties of high-speed (25 ns) 16kb PROM and 256 kb fast EEPROM devices. A transition from NMOS to CMOS technology is now

underway in the quest for higher-density EEPROMs. UV-EEPROMs were developed only in the last few years; the access time for a 1 megabit EPROM is 100 ns.

12. High-speed Arrays (6 Papers)

Semicustom arrays of the future were discussed at this conference for the first time. They are fabricated using bipolar, CMOS, and GaAs integrated processes. A single array of 20,000 CMOS gates with a quadrant structure contains either 5000 logic gates or 6000 SRAM devices in two of its four quadrants. Devices with 1 ns propagation delays and gate densities of 130 gates/mm^2 were fabricated by 1.5 u twin-channel technology. Also discussed was an emitter coupled logic (ECL) array with polysilicon emitter and base regions which employs ion injection into the base (0.1 u injection layer); in this device, the propagation delay is reduced to 120 ps, and the gate density is 100/mm^2. In addition, a 3.6 ns FET programmable logic array and an integrated GaAs gate array were discussed.

13. Special-purpose Data Processors (7 Papers)

Special-purpose processors are of great use in analog/digital, bipolar/CMOS, hardware/software interfacing. Thermal printers, local networks, digital facsimile transmission, and user telephone facilities were discussed. In general, telephone signals are affected not only by the equipment at the site of origin but also bv network losses and other factors that influence signal attenuation. At present it is thus advantageous to use CMOS technology to fabricate both analog and digital circuits to solve this problem.

14. High-speed Techniques and Designs (11 Papers)

In order to implement certain high-speed digital circuits, it is necessary to combine appropriate circuit design with suitable fabrication techniques, materials, and environmental conditions. Two CMOS circuits operating at room and at liquid nitrogen and hydrogen temperatures were discussed and compared. The delay in an 8 x 8b multiplier can be halved by cooling the device from room to liquid nitrogen temperature, and it drops further upon cooling to liquid hydrogen temperature. Maximum speed and minimum power consumption can be achieved by using 6GHz dividers (fabricated by Si bipolar technology) to combine ECL circuits with integrated injection logic circuits. The delay in hybrid gates can be decreased to 0.8 ns by combining different NMOS logic branches and NMOS-PMOS hybrid logic circuits in delay circuits. Moreover, silicon FET digital circuits in transmission gate circuits are always useful in logic and memory circuits. GaAs shift registers fabricated by this method can operate at frequencies from 1 MHz to 2.2 GHz.

15. Megabit Drams (10 Papers)

Megabit dynamic RAMs are just now leaving the experimental stage and entering trial production. Hardware design, fabrication, and packaging techniques were discussed. Both NMOS and CMOS devices are currently under development. NMOS is the dominant technology in the 256k DRAM arena, but CMOS is making positive contributions to DRAM (e.g., for fast access in longitudinal arrays, improved

a-particle immunity [due primarily to the presence of a trapping barrier], and in logic applications). The functional capabilities of a planar bipolar single-transistor device can be selected over a wide range by growing a layer of SiO_2 or composite Si_3N_4/SiO_2 insulation. The area of device packaging is currently controversial. Megabit DRAMs also require new mutually interconnected layers; these layers can be grown in two ways: 1) with only the metal sublayers of the different layers in contact; 2) with the layer of polysilicon or silicide material in contact with the diffusion region. One-micron line widths are used in both methods. Judging from the pace of current developments, 4 Mb DRAMs may well be available by the time next year's conference is held. However, different storage techniques will be required here (possibly involving multiple levels of storage or three-dimensional polysilicon topologies).

16. Fabrication Technology (7 Papers)

The ever-increasing precision, density, purity, and functional capabilities of large-scale-integrated (LSI) circuits have been accompanied by increased fabrication costs, which are high enough to discourage the widespread use of these circuits. Advanced designs for building large chips at reasonable cost were discussed from several viewpoints. Several speakers talked about using 3-micron technology to build fast, high-density devices; this is of particular interest because 3-micron technology is well-understood (it is currently the dominant fabrication technology) and should be capable of providing inexpensive, high-performance products. GaAs chips were also discussed; they are faster than silicon devices and have just recently become commercially available. A MODFET (modulated doped field-effect transistor) with a 17.6 ps gate delay time was described. Process and design techniques for fabricating high-power devices were also considered.

17. Monolithic Analog Filters (7 Papers)

Many types of monolithic filter designs were discussed. The reports started with a discussion of the relative capacities achievable in improved A/D and D/A converters; the use of new techniques to design accurate switched-capacitor filters was then discussed, and high-performance analog filters were described. By comparing analog filters with A/D, digital, and D/A converters in the context of analog signal states, one can precisely determine the trade-offs between precision, power, speed, dynamic range, chip size, rated capacity (amount of data that can be handled per second), etc. It was suggested that analog filters are still superior in certain areas (e.g., video applications); moreover, their power consumption is being greatly decreased and the range of applications is constantly increasing.

Representatives were also present at the second evening discussions, which formed an interlude in the main session. The following 11 topics were discussed: 1) artificial intelligence; 2) video signal processing; 3) the effect of standardization on future analog/digital systems; 4) the limits achievable in MOS devices at ultrasmall scales, and system applications; 5) nonvolatile circuits as standard components; 6) CAE work stations; 7) future methods for designing custom and semicustom circuits; 8) the structure of future A/D converters; 9) fault-tolerant techniques for constructing memory components;

10) digital equipment employing internally connected optical circuits; 11) the challenges posed by high-speed LSI and CMOS VLSI technologies.

As a participant in this year's activities, I went away with the following three main impressions.

1. Internal corporate work on basic research and manufacturing has kept pace with rapid developments in microelectronics in recent years. This process has been stimulated by polling technical knowledge and equipment.

A total of 107 reports and plenary address were presented at this session. Current trends in research were covered worldwide, and more than half (61) of the invited papers were given by participants from European and Asian countries, particularly Japan (48 reports were from Japan, 3 each from Great Britain and Holland, 2 each from West Germany, Belguim, Switzerland, and one from France); 47 reports were presented by American participants (41 from the United States, 5 from Canada, 1 from Mexico). The Japanese contributions accounted for 44 percent of the total, while the United States, which hosted the conference, accounted for 38 percent. Judging from the conference, the Japanese work has the following four characteristic features. a) Most of the research is the product of cooperation between researchers and manufacturers, and research/production teams have been formed for developing new products. Several present at the conference asked whether the Japanese ideas had passed from the laboratory to the production stage, and in all cases the answer was an unequivocal "Yes." This is the result of Japan's awareness of the need for product development to be guided by the latest theoretical knowledge, and that Japan must rely on increasing its technical productivity if it is to survive; research and development effort has increased accordingly. However, the Japanese also want to share in and benefit from promising scientific advances in the United States and Europe. For this reason, the 10 large corporations participating in the conference sent large delegations to collect information and bolster their prestige. b) Some duplication of research effort is inevitable within any large corporation, but the pattern varies from case to case. Of the 17 specialized topics touched upon, 15 were covered by the Japanese; in addition to being very broad, their research was also impressive for its depth. In the order in which they appeared, the reports were given by Hitachi (13) Toshiba (9), Nippon Electric (8), Fukitsu (4), Mitsubishi (4), Matsu Shita (3), ... c) Careful attention was given to preparing the reports; in particular, the explanatory figures and graphs were very helpful in getting the ideas across. d) The extensive scope of present efforts in submicron VLSI research was apparent from the preponderance of papers concerned with topics in high power, high speed, high density, and high levels of integration.

On the other hand, the Americans remain confident. The characteristics of U.S. research were revealed by the reports given by the 27 participating U.S. corporations and universities. Their efforts are focused on strengthening existing basic research to come up with new products and on capitalizing on their strong position and inventiveness. The U.S. contribution was as follows; AT&T Labs (6), Fairchild (3), Texas Instruments (3), IBM (2), Motorola (2), Intel (2), Mostek (2), etc. AT&T is reported to have built a very large IC fabrication plant in Orlando, Florida, which will strengthen the company's position in

developing microcircuit technology and applications. East-West technology exchanges are constantly increasing, and a free exchange of developments among countries is inevitable.

2. With linewidths in VLSI chips now as small as 1 micron, submicron geometries are already being investigated. The 256 k memory chips have reached maturity, and 1 Mb chips are commercially available. Current development trends lie in two directions: 1) high densities, speeds, and levels of integration--progress here will depend on advances in hardware design; 2) formation of intelligent systems according to agreed-upon standards (this is user- rather than hardware-oriented). Microelectronics researchers are presently engaged in work in the areas of CMOS, CAD, CAE, and custom and semicustom circuit design.

3. Finally, we discerned a reliance on in-house development strengths to achieve very definite objectives. However, vigorous progress will depend on continuous advances and improvements in international technical invention and productivity, which must be based on technical levels already achieved in each country and be consistent with the local working environment. By convention, the yearly conference alternates between San Francisco and New York. Generally, there are four times as many Westerners as Asians, although this year the situation was reversed, for two main reasons: 1) because of the current glut of semiconductors on the U.S. market, many technical specialists and entrepreneurs want fresh ideas in solid-state circuits and want to analyze the latest trends in VLSI research and development; they hope that an infusion of fresh ideas will guide them toward perfecting or changing their own product lines and make them more competitive. 2) Because of the rapid pace of development in microelectronic technology, new breakthroughs have been made in the year since the last conference in the areas of bipolar devices, RAM, CMOS technology, megabit memory chips, microprocessors, floating point processors, integrated digital communications networks, and CAD. This attracted the interest of specialists from all over the world, who came to the meeting to gain an understanding of the many new theories, ideas, and products in order to seek out new paths of development for themselves.

12617/12790
CSO: 4008/1007

CHINA DEVELOPS 'ADVANCED' LASER CRYSTAL

OW231000 Beijing XINHUA in English 0701 GMT 23 Dec 85

[Text] Beijing, 23 Dec (XINHUA)--China has developed an advanced laser crystal, becoming the second country after the United States to develop such a material, according to the State Bureau of Building Materials Industry.

The non-linear optical material is an artificially grown monocrystal called "potassium titanyl phosphate". It can turn invisible infrared laser light into a high frequency visible green laser light, increasing the penetrating capacity through sea water and other media.

Scientists of the bureau said that the new crystal will be used for submarine laser communications, continental shelf surveys, and satellite distance measurement. It can also be applied to laser therapy, detection of deep-sea fish schools, holography, and other fields.

Experts here said that only China and the United States have such a crystal applicable to laser equipment. China developed the monocrystal in a little more than a year using an improved flux process, according to the experts.

A professor at Stanford University wrote that the crystal developed by Chinese scientists is the "biggest and best" monocrystal of potassium titanyl phosphate grown with the flux process in the world.

China will start mass production of the monocrystal "very soon", according to the State Bureau of Building Materials Industry.

/6091
CSO: 4010/27

APPLIED SCIENCES

BRIEFS

HIGH-SPEED HOLOGRAM CAMERA DEVELOPED--Tianjin, 12 Dec (XINHUA)--A high-speed hologram camera, believed to be world-class, has been developed by Tianjin University scientists. It can shoot four photos in succession in transients of 2-100,000th of a second, with an interval of 5-millionth of a second between photos. At present, two photos are the international norm for such instruments, according to a university spokesman. The camera, developed by faculty members of the university's department of precision instruments, is designed to shoot transient processes like the vibration of lathe tools at high-speed rotation. The components of the camera are all made in China, the spokesman said. [Text] [Beijing XINHUA in English 1232 GMT 12 Dec 85 OW] /6091

CSO: 4010/27

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10424/9365
CSO: 4008/19

STUDY ON NORMALIZATION OF INSTRUMENT FOR MEASURING MODULATED TRANSFER FUNCTION IN INFRARED RANGE AT ZERO SPATIAL FREQUENCY

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese Vol 4 No 5, Oct 85 pp 335-340

[Article by Feng Zhuoxiang [7458 0587 4382] and Liu Zhongben [0491 0022 2609], Xi'an Institute of Applied Optics]

[Abstract] While measuring the modulated transfer function (MTF), the normalization precision at zero spatial frequency can affect measurement accuracy of MTF. The paper discusses two computing methods of instrument normalization for MTF measurement in the infrared range: rectangular grating and wagon wheel chopper. These two methods are compared with each other. The authors developed an instrument for measuring MTF in the infrared range as shown in the following photograph:

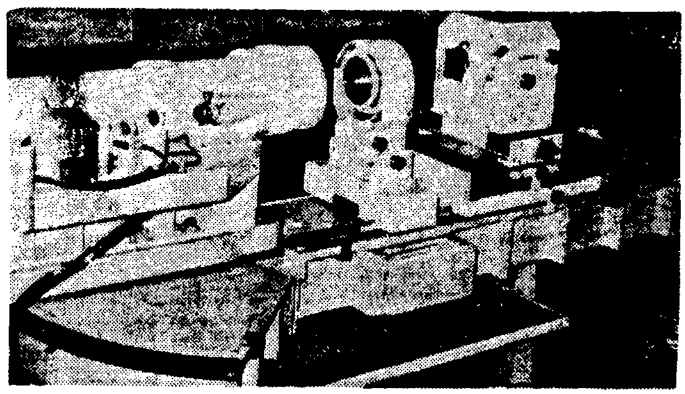
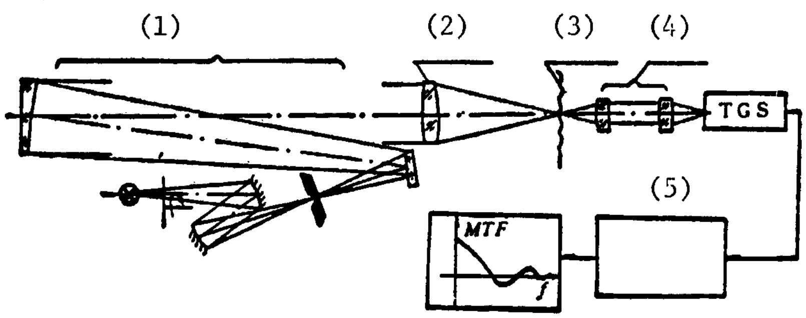


Fig. 1

This is an accurate measurement instrument for the 2-14 μm wave band. The optical system is shown in the following diagram:



Key:

1. Parallel light tube
2. Objective lens
3. Scan grating
4. Condensing lens
5. Frequency-selective amplification circuit

Fig. 2 The optical system of the instrument for measuring MTF in infrared range

Three other figures show a graphical method for the convolution operation, a rectangular target modulated by a wagon wheel chopper, and size variation of images in the optical system. One table lists calculated values of MTF. The authors are grateful to colleagues for their assistance and support while writing the paper. The paper was received for publication on 13 August 1984.
10424/12859

FLUORESCENT SPECTRA OF Cr^{3+} IONS IN OXIDES OF HIGH VALENT-CATIONS, POSSIBILITY TO USE THEM AS TUNABLE LASER MATERIALS

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese Vol 4 No 5, Oct 85 pp 355-360

[Article by Luo Zundu [5012 6690 1653], Chen Jiming [7115 4949 2494] and Chen Tao [7115 3447], Fujian Research Institute of Matter Structure, Chinese Academy of Sciences]

[Abstract] The fluorescent spectra and fluorescent lifetime measurements of Cr^{3+} ions in four oxides (potassium aluminum molybdate, aluminum tungstate, aluminum niobate and aluminum tantalate) are reported. The wavelength of the fluorescent peaks of these samples is longer and their bandwidth wider than that of alexa-drite and many other chromium-doped tunable laser materials. The crystal field of the Cr^{3+} ions is weakened by the polarization effect of the high valent-cations, so the wavelength of the $^4T_2$-$^4A_2$ vibronic transition is moved to the infrared side. These materials have a strong enough electron-phonon coupling or large enough Huang-Rhys factors. In this way one can expect to obtain a series of tunable laser materials which have a broad tunable range and a wavelength of emission peaks longer than 800 nm. Six figures show fluorescent spectra and absorption spectra of Cr^{3+}, a fluorescent measurement device layout and its measurement of fluorescent lifetime using a pulse decay method. Three tables list fluorescent lifetime and spectroscopic data of samples, comparison of the phonon sideband peak wavelength of Cr^{3+} ions in different hosts, and the relationship between the separation of $^4T_2$ and ^2E and its effective lifetime. Samples used in experiments were prepared by Wang Guofu [3769 0948 1381], Jiang Aidong [3068 1947 2767] and Zhang Aifang [1728 1947 5364]. The paper was received for publication on 1 February 1985.
10424/12859

INVESTIGATION ON MEASUREMENTS OF SURFACE EMISSIVITY, TEMPERATURE OF GROUND OBJECTS UNDER NORMAL CONDITIONS

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese Vol 4 No 5, Oct 85 pp 361-369

[Article by Li Chunhuai [2621 2504 2849] of Changchun Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Abstract] The paper presents a measurement method of surface emissivity and temperature of ground objects. Measurements can be made with an infrared radiometer. Blackbody radiation at the same temperature of the ground object is obtained using a cylindrical direct reflection cavity. Environmental

radiation is measured using a constant emissivity board. Experiments support this method. This measurement method is reliable and simple without strict temperature control expecially in nighttime field measurements. Even better results can be obtained by strictly controlling the spectral characteristics of the infrared radiometer used in the 8-14 μm wave band. Three figures show schematic diagrams of the measurement setup and process, and a temperature-voltage curve for calibration of the infrared radiometer. Five table list values of effective emissivity under different conditions, voltage outputs of the radiometer placed on the ground and floating in the water, temperatures of an aluminum plate placed in the water, and the measured emissivity values of ground objects. The author is grateful to the following colleagues: researcher Tang Jiuhua [0781 0046 5478] and associate researcher Feng Jiazhang [7458 1367 3864] for their advice, and teacher Zhang Caigen [1728 2088 2704] of the Shanghai Institute of Technical Physics, Chinese Academy of Sciences, for his assistance. The first draft was received on 2 November 1984; the final, revised draft was received for publication on 18 March 1985. 10424/12859

CSO: 4009/35

RESOURCE CONDITION FOR CONSTRUCTION OF URANIUM MINES AND SOME POINTS FOR ATTENTION

Beijing YOU KUANG YE [URANIUM MINING AND METALLURGY] in Chinese Vol 4 No 4, Nov 85 pp 1-5

[English abstract of article by Chen Hexing [7115 0735 5281]]

[Text] Based on a comprehensive investigation of uranium resources and of the fundamental data and problems in the design and construction of uranium mines in China during the past 20 years, the author presents his ideas about the resource conditions under which design and construction will be conducted, problems which will possibly occur in uranium mines in the future and measures which should be adopted. It is hoped that new uranium mining enterprises will gain economic benefits from the contents of this paper.

STATISTICAL ANALYSIS IN THIN-LAYER LEACHING EXPERIMENTS

Beijing YOU KUANG YE [URANIUM MINING AND METALLURGY] in Chinese Vol 4 No 4, Nov 85 pp 6-13

[English abstract of article by Jin Suoqing [6855 6956 1987] and Tian Xincheng [3944 2450 1004], et al., of the Beijing Research Institute of Uranium Ore Processing]

[Text] In this paper a description is given of the statistical design and analysis of experiments in Thin-Layer (TL) leaching. The TL leaching test contains three parts: selecting the size of crushed uranium ore, determining the conditions for pugging of crushed ore with strong acid and subsequent curing of the impregnated ore, and selecting the feasible parameters of the leaching-rinsing. The factorial design was adopted in the size selection experiments and the cross-cut design (the incomplete factorial design) in the pugging and curing experiments. The variance analysis was used in processing the experimental data.

The results of the research on TL leaching of uranium ore prove that if mathematical statistical analysis is applied instead of the conventional experimental method (i.e., every influential parameter is changed by turns while the others are kept unchanged), it is possible to conduct in-depth research on the TL leaching process.

SEPARATING URANIUM AND THORIUM FROM RARE-EARTH CHLORIDE SOLUTIONS BY HD(DIBM)P

Beijing YOU KUANG YE [URANIUM MINING AND METALLURGY] in Chinese Vol 4 No 4, Nov 85 pp 14-20

[English abstract of article by Qiu Weizhi [6726 0251 0037], Wang Shunchang [3769 7311 2490] and Fan Jiajun [5400 1367 7486] of the Beijing Research Institute of Uranium Ore Processing]

[Text] Separation of uranium and thorium from rare-earth chloride solutions by solvent extraction has been studied. The experimental results show that the uranium and/or the thorium in lower concentrations can be separated from the rare-earth chlorides in higher concentrations by a mixture of di-(diisobutylmethyl) phosphoric acid [HD(DIBM)P] and trialkylphosphine oxide (TRPO) in kerosene. The distribution ratios of uranium and thorium are 206 and 13.9 respectively and the separation factors of uranium and thorium to rare-earth chlorides are 5.7×10^5 and 3.9×10^4 respectively in the single-stage extraction at phase ratio (organic : aqueous) of 1:1 from the chloride solutions containing uranium (1 g/l), thorium (1 g/l) and rare earths (RE_2O_3, 100 g/l) with 0.1M HD(DIBMP-0.05M TRPO in kerosene. The uranium and thorium can be effectively removed from the rare-earth chlorides during counter-current extraction at the phase ratio (organic : aqueous) of 1:4.

9717
CSO: 4009/33

OPTICAL SECOND-HARMONIC GENERATION BY SURFACE PLASMON WAVES AND ITS APPLICATION.* I. SECOND-HARMONIC GENERATION BY LONG-RANGE SURFACE PLASMON WAVES

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 11, Nov 85 pp 961-968

[English abstract of article by Chen Zhan [7115 3277], Zheng Jiabiao [6774 1367 7516], Wang Wencheng [3769 2429 3397], et al., of the Department of Physics, Fudan University, Shanghai]

[Text] We have made the first observation of the enhancement of SHG signals produced by long-range surface plasmon waves (LRSPW) in a homogeneous dielectric-Ag film-homogeneous dielectric configuration. The SHG intensity under excitation of LRSPW has been calculated by means of a propagational matrix of light in a multilayer structure. The theoretical analysis agrees well with experimental results.

* Supported by the Scientific Foundation, Chinese Academy of Sciences.

OPTICAL SECOND-HARMONIC GENERATION BY SURFACE PLASMON WAVES AND ITS APPLICATION.* II. INVESTIGATION OF THE NONLINEARITY OF ADSORBED MOLECULES

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 11, Nov 85 pp 969-974

[English abstract of article by Chen Zhan [7115 3277], Wang Wencheng [3769 2429 3397], Zheng Jiabiao [6774 1367 7516], et al., of the Department of Physics, Fudan University, Shanghai]

[Text] Surface-enhanced second-harmonic generation (SHG) of the reflection from a surface covered with a Langmuir-Blodgett mono-molecular layer of fatty acid is studied under conditions of surface plasmon excitation. Experimental results of SHG signals are in good agreement with theoretical calculations and the nonlinear polarizability coefficient d_{33} for a single arachidic molecule is estimated to be 0.32E-29 esu.

* Supported by the Scientific Foundation, Chinese Academy of Sciences.

HIGH-EFFICIENCY FREQUENCY DOUBLING USING A LARGE-APERTURE KDP CRYSTAL

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 11, Nov 85 pp 975-979

[English abstract of article by Cai Xijie [5591 1585 3381], Shu Meidong [5289 5019 0392], Qin Wenhua [6009 2429 7520], et al., of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] Using a 3-cm-thick type II KDP crystal at input intensity of 0.27 GW/cm^2, an overall doubling energy conversion efficiency up to 61.5 percent has been achieved in our experiments. The 1.06 μm laser beam has an aperture of 42 mm and a divergence of ~0.5 m rad. The temporal distribution of the intensity is nearly Gaussian. Experimental results are in agreement with theoretical calculations.

INTERACTION OF LIGHT WITH DRESSED ATOMS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 11, Nov 85 pp 1009-1017

[English abstract of article by Lin Fucheng [2651 4395 2052] and Huang Youhong [7806 0327 1347] of Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences]

[Text] The interaction of light with dressed atoms is discussed. Master equations which normally appear as an infinite set of first-order differential equations coupled with each other are simplified to four independent equations, leading to Bloch equations for dressed atoms through which all the coherent interactions of atoms with light can be extended to the case of dressed atoms. The susceptibility of the dressed atoms to two probe beams is deduced. The generation and characteristics of the phase conjugation wave in dressed atoms are studied.

DATA ANALYSIS OF INFRARED REFLECTION SPECTRA OF $LiNbO_3$ AND OTHER CRYSTALS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 5 No 11, Nov 85 pp 1046-1055

[English abstract of article by Liu Yan [0491 3601] and Liao Liji [1675 3801 0415] of the Department of Applied Physics, Beijing Polytechnic University]

[Text] Data analysis is made by using the classical oscillator fit method with preliminary data obtained from a Kramers-Kronig analysis which leads to a rapid convergence of the procedure. It has been found that the procedure can be used satisfactorily for the analysis of infrared reflection spectra of both the crystals (such as α-quartz) with separated bands, and $LiNbO_3$ with overlapping bands having remarkably different intensities. Even those spectra with weak bands fading into strong ones can be processed satisfactorily.

9717
CSO: 4009/32

EVOLUTION OF ELECTRON DISTRIBUTIONS IN ELECTROSTATIC ION CYCLOTRON WAVES WITH ASSOCIATED PARALLEL ELECTRIC FIELD AND ANALYSIS OF RESULTING INSTABILITIES

Beijing KONGJIAN KEXUE XUEBAO [CHINESE JOURNAL OF SPACE SCIENCE] in Chinese Vol 5 No 4, Oct 85 pp 254-261

[English abstract of article by Wang Yuandian [3769 0337 3013] and Cai Hengjin [5591 1854 6651] of the Institute of Space Physics, Chinese Academy of Sciences]

[Text] An electrostatic ion cyclotron wave (EIC) can induce anomalous resistivity and a parallel electric field. In this paper the evolution of the distribution of electrons is analyzed. The results show that the distribution can be divided into two groups--the trapped part and the run-away part. Two-stream instability can flatten the distribution of the run-away electrons, resulting in a distribution with a long, flat tail. This kind of distribution is not stable for anomalous cyclotron resonance in certain velocity space, resulting in thermalization and pitch-angle scattering of the electrons and, therefore, a loss in parallel velocity of the electrons. This instability results in the establishment of a bump-on-tail distribution, then a new instability develops and results in a flattening of the bump-on-tail. This instability can ramp the parallel velocity around a critical value. After that, a small part of the electrons can be accelerated further, but very slowly, and at the same time be thermalized.

The results included in this paper are compared with those of the observation of wave fields and precipitating electrons, and a general consistency is shown.

SLOSHING OF LIQUID IN SPHERICAL TANK AT LOW-GRAVITY ENVIRONMENTS

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[English abstract of article by Wang Zhaolin [3769 3564] and Deng Zhongping [6772 6850 1627] of the Department of Engineering Mechanics, Qinghua University]

[Text] In this paper the sloshing of liquid in a spherical tank is investigated under low-gravity conditions. After determining the equilibrium shape of the free surface of the liquid, using a method for a kind of characteristic functions expanded into polynomial expressions, the free and forced sloshing problem has been solved. The computer results for sloshing frequencies, dynamic coefficients and the damping ration have been obtained.

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